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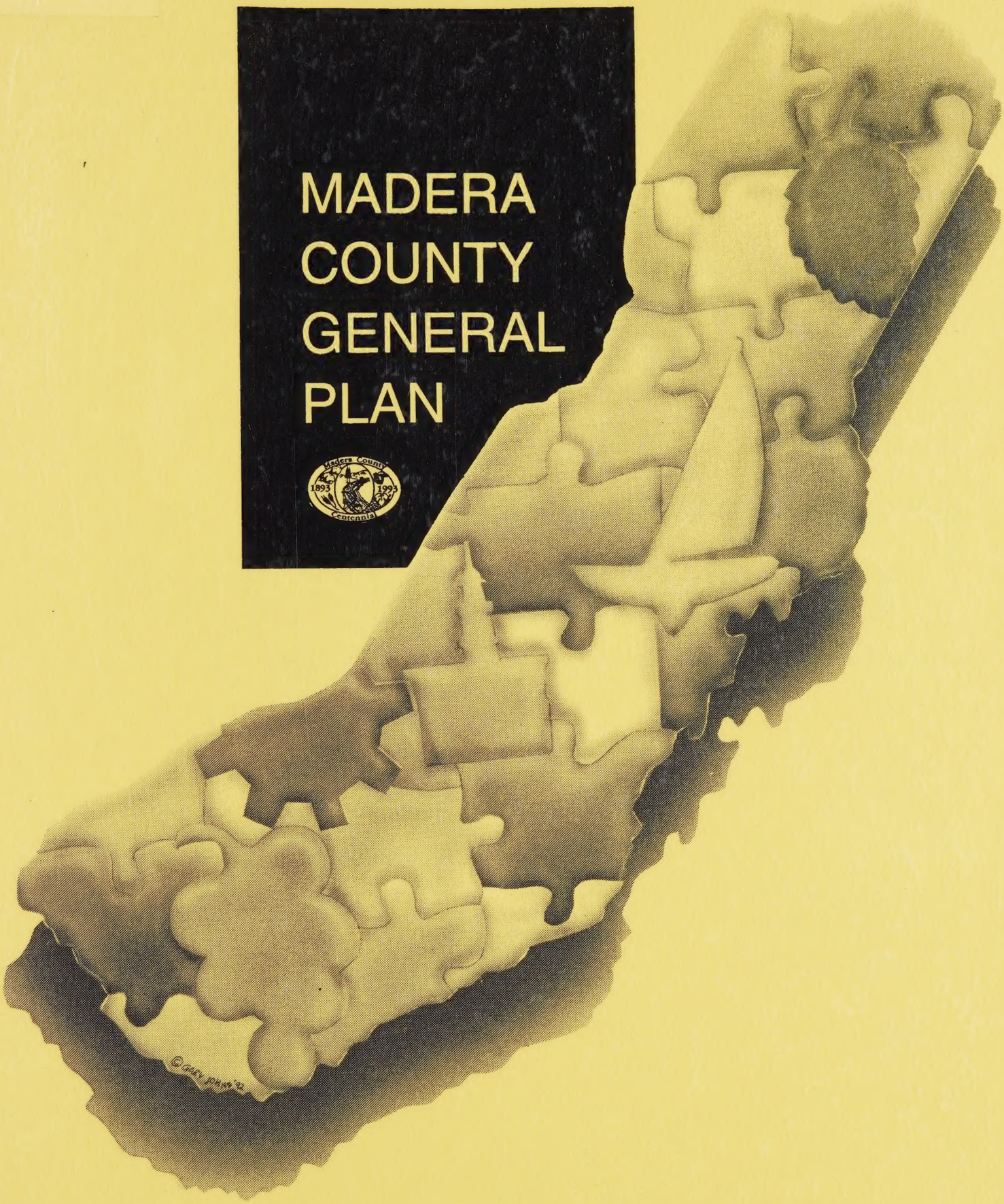
MADERA COUNTY GENERAL PLAN



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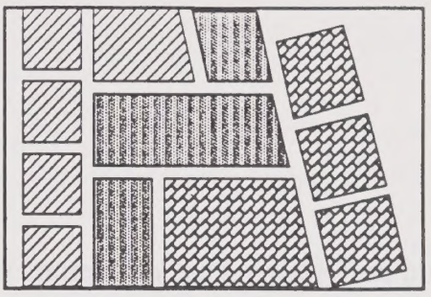
INTRODUCTION

INTRODUCTION

This document contains background information compiled for the Madera County General Plan. The report addresses all the significant issues to be addressed in the Plan and also serves as the "environmental setting" portion of the environmental impact report that was prepared on the *General Plan.* It is organized into eight chapters, as follows:

Chapter 1: Land Use
Chapter 2: Population and Employment
Chapter 3: Transportation and Circulation
Chapter 4: Public Facilities and Services
Chapter 5: Cultural and Recreational Resources
Chapter 6: Agricultural and Natural Resources
Chapter 7: Safety
Chapter 8: Noise

The *Background Report* was prepared jointly by a multi-disciplinary consulting team headed by J. Laurence Mintier & Associates, and the Madera County Planning Department. Mintier and Associates was responsible for preparing Chapter 1, *Land Use*, and Chapter 2, *Population and Employment.* Dowling Associates and County staff were primarily responsible for preparing Chapter 3, *Transportation and Circulation.* County staff was primarily responsible for preparing Chapter 4, *Public Facilities and Services*, and Chapter 5, *Cultural and Recreational Resources.* H. T. Harvey & Associates was responsible for preparing the biological resources section of Chapter 6, *Agricultural and Natural Resources*; Donald Ballanti prepared the air quality section of Chapter 6. Mintier & Associates was responsible for preparing the balance of Chapter 6 and all of Chapter 7, *Safety.* Brown-Buntin Associates was responsible for preparing Chapter 8, *Noise.* H. T. Harvey & Associates prepared the *Background Report* graphics. Mintier & Associates was responsible for compilation and editing of the entire report.



CHAPTER 1

LAND USE

CHAPTER 1

LAND USE

1.1 INTRODUCTION

Land use is the principal focus of the general plan. This chapter provides a context for the General Plan by describing existing land use conditions and local, regional, state, and federal plans and policies that have a bearing on land use in Madera County. Proposed land use changes are described in the *General Plan Policy Document* and the *Environmental Impact Report.*

This chapter describes the former (1969) Madera County General Plan, area plans, zoning, and existing land uses. The chapter also summarizes the general plans for the cities of Madera and Chowchilla, describes the role of LAFCO, and summarizes other city, county, and regional plans and policies which may have a bearing on land use planning in Madera County.

REGIONAL SETTING

Madera County is located in the central portion of the San Joaquin Valley and also includes part of the Sierra Nevada foothills and mountains. The geographic center of California is found in Madera County. The county contains part of the Sierra and Inyo National Forests and Yosemite National Park. State Highway 99 provides the main north-south access through the valley portion of the county, and is the principal transportation corridor connecting the county to points north and south. State Route 41 provides access to and from the Fresno metropolitan area for the foothills and mountains of Madera County, passing through the communities of Coarsegold and Oakhurst; it is the major southern route into Yosemite National Park. State Route 152 provides east-west connections from State Route 99 to Los Banos and points west. Figure 1-1 depicts Madera County's general location.

COUNTY BOUNDARIES

Madera County's jurisdictional boundaries are generally defined by rivers and geological features. The northwestern boundary between Madera and Merced County is the Chowchilla River. The western and southern boundaries between Madera and Fresno Counties are formed by the San Joaquin River. The crest of the Sierra Nevada forms the eastern boundary with Mono County. Madera County is bounded by Mariposa County on the northeast. The county, which encompasses 2,147 square miles, can be generally divided into three general topographical areas: a valley area; a foothill region east of the valley area; and a mountain region east of the foothills.

The county includes two incorporated cities (Madera and Chowchilla), both located along Highway 99, and several unincorporated communities. Figure 1-2 shows the county boundaries and the location of the county's communities.

1.2 1969 MADERA COUNTY GENERAL PLAN

GENERAL PLAN CONTENT AND ORGANIZATION

Madera County's former General Plan was originally adopted in 1969. The *1969 General Plan* included a *Land Use Element*, *Transportation and Circulation Element*, *Recreation Element*, and *Housing Element*. The original *Housing Element* has since been superseded by several revisions since its adoption in 1969. In 1972, the County adopted an *Open Space and Conservation Element*. In the late 1970s the County adopted a *Safety Element* (1977) and a *Noise Element* (1978). In 1987, the County added a Mineral Resources Section to the *Open Space and Conservation Element*. The County periodically revises and updates the *Housing Element*; the most current version was adopted in November 1993 and was certified by the State Department of Housing and Community Development.

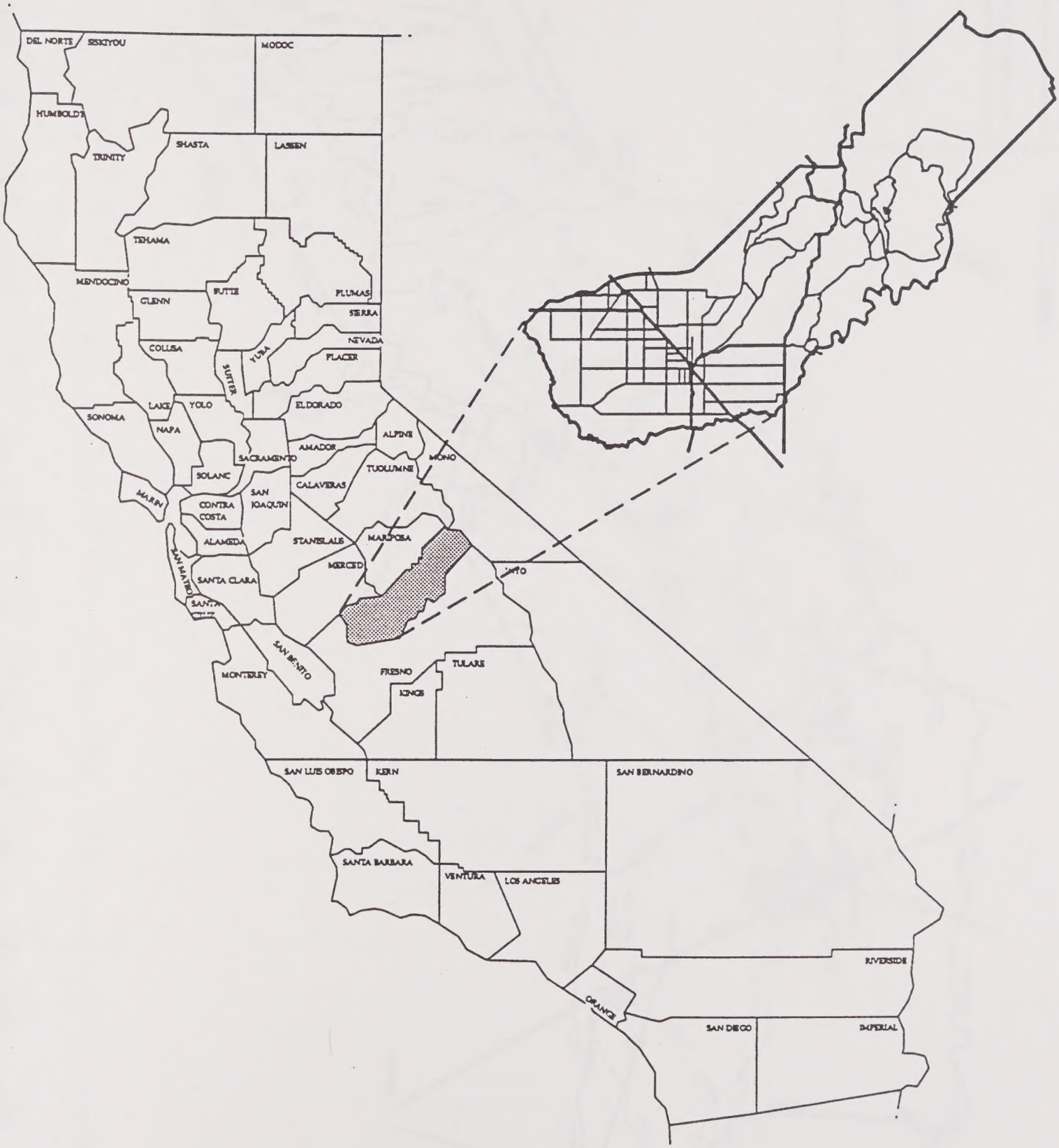
1969 General Plan Objectives

The *1969 General Plan*, which included the *Land Use Element*, *Transportation and Circulation Element*, *Recreation Element*, and a *Housing Element* (since superseded) included several overall objectives, as summarized below:

- To improve the physical environment of the county and its communities
- To guide and direct the development of urban land uses into urban areas of the county and to discourage or guide these urban land uses away from agricultural activities
- To provide for sufficient, well located places for various land uses, including industry, recreation, residential development, commercial activity, and agricultural uses
- To improve the circulation and transportation routes
- To provide for provision of public facilities for the redevelopment of many small community areas in the county
- To encourage the advance acquisition and planned development of recreational facilities

The following paragraphs describe each of the existing General Plan elements, briefly summarizing their structure and general content.

FIGURE 1-1
MADERA COUNTY LOCATION



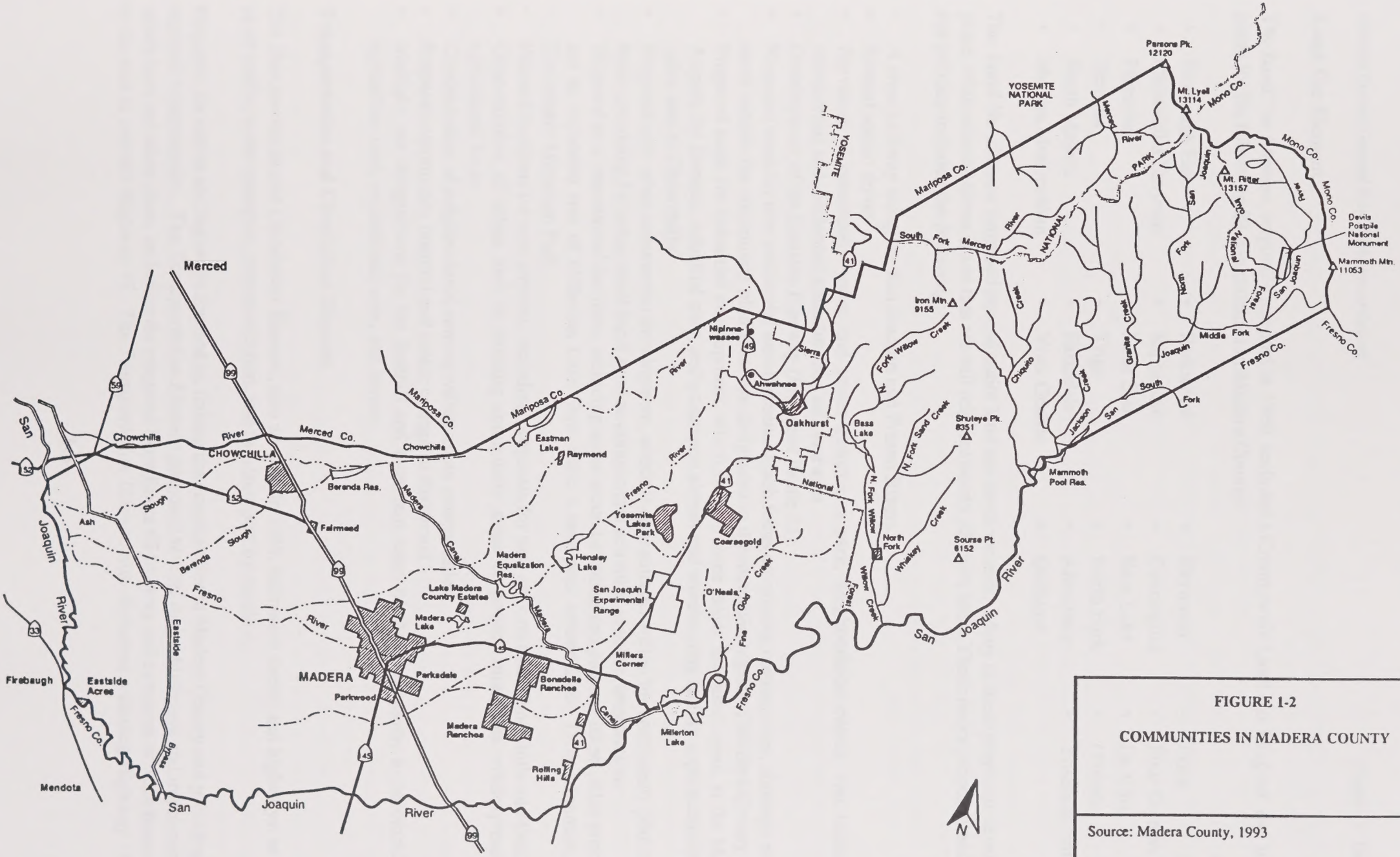
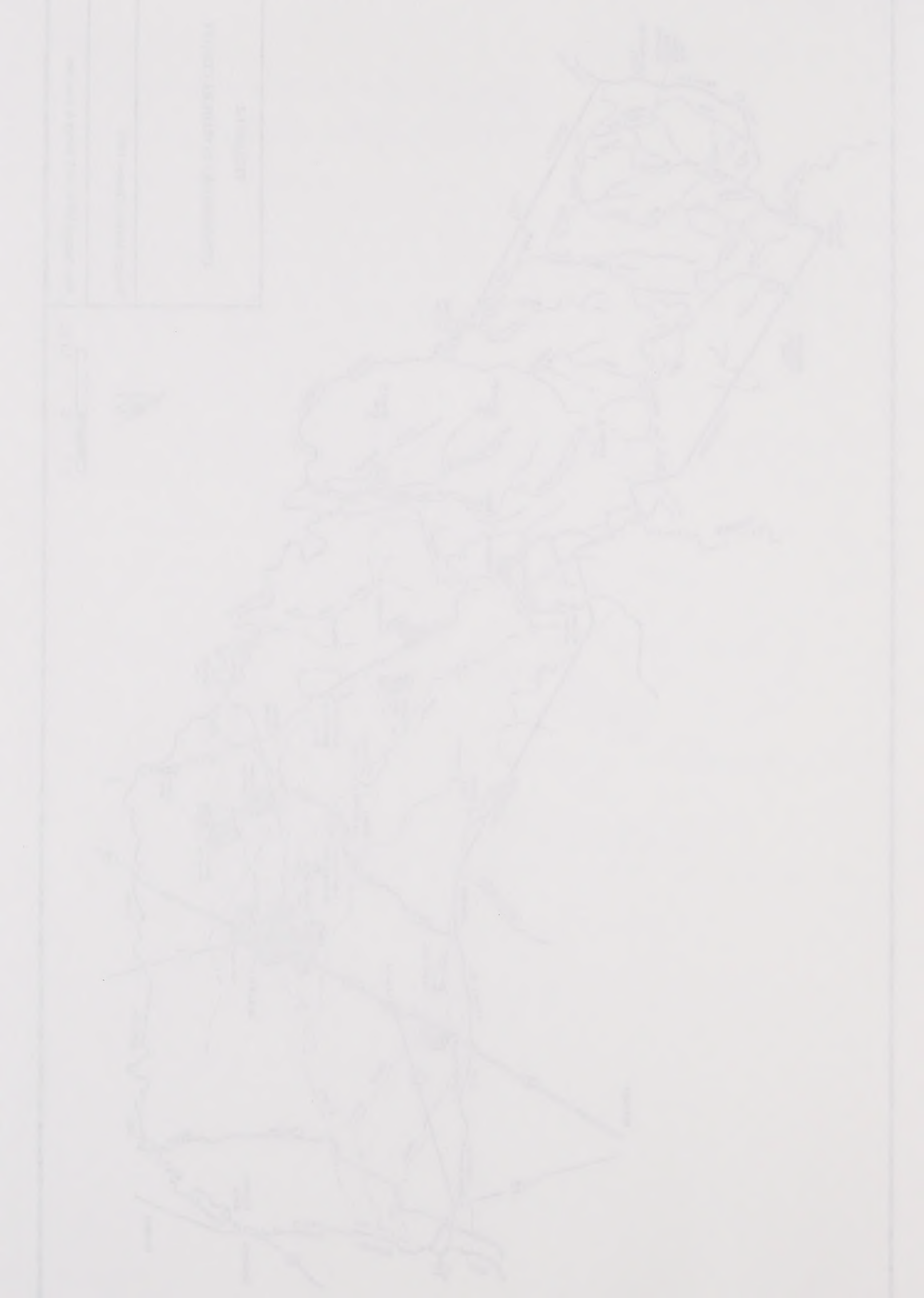


FIGURE 1-2

COMMUNITIES IN MADERA COUNTY

Source: Madera County, 1993

Maps Prepared 8/93 by: H. T. Harvey & Associates



Land Use Element

The *Land Use Element*, originally adopted in 1969, included a Countywide Land Use Diagram and smaller plans for the following 23 communities in Madera County:

- Firebaugh East
- Chowchilla Environs
- Fairmead
- Berenda
- North Madera
- Madera Metropolitan
- Parkwood
- Ripperdan
- Lone Star
- Trigo
- Parksdale
- Vista Grande
- Raymond
- Coarsegold
- Bass Lake
- North Fork
- Ahwahnee
- Oakhurst
- Price
- Four Corners
- La Vina
- O'Neals
- Yosemite Forks

The *Land Use Element* proposed several major land use developments. Many of these proposals never took place, while others address issues that are still relevant nearly 25 years later. These major proposals and land use policies included the following:

- A river parkway along the San Joaquin and Fresno Rivers
- Several scenic drives
- Provision of community water and sewer systems, a park, neighborhood center, and intensified commercial and residential areas for the Oakhurst area
- Development of the Eastside Freeway (Proposed Route 65)
- Proposed areas for new residential development, which focus on existing communities, although several areas outside the community plan areas are designated in the mountain region of Madera County
- Proposed areas for industrial development, which include three major industrial areas, at the Madera Airport, the Berenda industrial tract, and a transport airport and warehousing facility approximately four miles east of Chowchilla
- Proposed new urban commercial development, which is concentrated within the community plan areas, while providing for some small local service-commercial activities at minor intersections
- Proposed new recreational facilities, including areas around existing and planned lakes. Also proposed are an expanded area of Millerton Lake State Park, a new park around Little Table Mountain, and Thornberry Mountain Park
- Planned locations for new airports, including proposals for new airports near Chowchilla and Oakhurst
- Concentration of urban uses in existing community areas to protect rural uses, while protecting agricultural lands
- Concentration of neighborhood centers within urban communities
- Proposed community hospital and junior college in Parkwood
- Multiple use designations for the foothill and mountain areas of the community, to accommodate agriculture uses, recreational uses, and homes

Transportation and Circulation Element

The *Transportation and Circulation Element*, also adopted in 1969, addressed streets and highways, as well as air traffic, water transport, communication, and fuel transport by pipeline.

Proposals for streets and highways focused on linking the communities in Madera County and providing for regional transportation. The *Transportation Element* proposed several major highways and improvements which have not taken place, including the proposed State Route 65 freeway and extension of State Route 152 to the east to connect Highway 41. The *Transportation Element* also discussed widening Highway 145 to

four lanes and relocating Highway 145 though Madera and Ripperdan. The *Transportation Element* also proposed several scenic routes.

The *Transportation Element* proposed numerous new airport facilities, including a privately operated transport aircraft center and warehousing facility at a location approximately four miles northeast of Fairmead. Other proposals included airstrips near many of the communities and new airports in the mountain and foothill areas.

The *Transportation Element* also proposed a slurry pipeline from the mining region to the valley for the transport of ores; a transportation corridor for all transmission facilities (e.g., pipelines, transmission lines); expansion of the public transportation system, including bus systems from the foothill communities into Madera; and landfill sites near each community.

Recreation Element

The *Recreation Element* was also part of the *1969 General Plan.* The *Recreation Element* discussed how the various regions of the county were used for public recreation and described proposals for new lakes and park and recreation areas.

Included within the *Recreation Element* was an *Archaeological Element.* The *Archaeological Element* summarized the prehistory of Madera County and recommended reconnaissance of sites and salvaging of archaeological resources as conditions for new development.

Open Space and Conservation Element

The *Open Space and Conservation Element* was adopted in 1972. The *Open Space and Conservation Element* addressed natural resources, including geology, groundwater, and surface water resources, described economic issues related to open space dedication, and discussed open space for transportation and circulation corridors, fire hazards, and major recreational areas. Major policies contained in the *Open Space and Conservation Element* are summarized below.

- Provide for large-lot agricultural and rangeland uses in suitable areas of the county
- Relate the Open Space Plan to the soils, topography, and other surface geological features
- Preserve critical water recharge areas in sufficient quantities to ensure continued groundwater recharge
- Provide for open space and recreational areas in existing urban and suburban developed areas where needed
- Designate scenic highway corridors, some rivers, canals, and reservoirs as open space corridors
- Designate recreational areas for county, state, and federal existing or planned park and recreational areas
- Designate national forests, national wildlife areas, and national parks areas as open space
- Outline a route for the trans-Sierra highway
- Support plans for the proposed Soquel water supply project
- Support other General Plan policies related to open space protection
- Protect special wildlife needs
- Integrate the plans and policies of the cities and unincorporated communities into the *Open Space Element*
- Review and revise local ordinances to provide for open space protection
- Coordinate the County's open space policies with federal, state, and regional programs
- Designate Williamson Act lands for open space

- Address open space programs on a regional basis where it would pose an economic burden on the County to provide for regional open space needs

Mineral Resources Section

The Mineral Resources Section of the *Open Space and Conservation Element* was adopted in 1987 to address issues mandated by the state Surface Mining and Reclamation Act (SMARA). The following summarizes the main policies of the Mineral Resources Section.

- Mineral extraction policies should be coordinated with the City of Fresno and Fresno County
- Areas designated as containing significant mineral deposits shall be zoned for open space and agricultural uses
- Incompatible land uses shall not be permitted within the impact areas and areas identified to have significant mineral and gravel deposits
- All surface mining operations shall be subject to a conditional use permit, which shall include a mining plan and reclamation plan
- The County shall establish a buffer zone between surface mining and incompatible land uses

Safety Element

The *Safety Element* was adopted in 1977. The *Safety Element* addressed seismic hazards, flood hazards, fire hazards, man-made hazards, and other hazards, including crime and vehicle safety.

The *Safety Element* recommended several measures to address safety in Madera County, including the following:

- Geologic and engineering investigations for proposed development projects
- Regulatory and corrective measures to address flood hazards
- Development of regulatory standards and programs for development in high fire hazard areas
- Development of a traffic safety program and improvement of the county's transportation system

Noise Element

The *Noise Element*, adopted in 1978, addressed several background topics on noise, including definitions of noise, noise measurement, and the general effects of noise. The *Noise Element* also discussed general sources of noise, including transportation sources, industrial sources, occupational noise sources, and construction-related noises, and described noise control measures for these sources. The *Noise Element* then discussed the local regulatory methods of noise control, described and mapped noise-sensitive land uses in the county and the county's major noise generators. Finally, the *Noise Element* included an implementation section for controlling noise impacts in the county.

Housing Element

The current *Housing Element* was adopted in 1993 as an update to the County's *1985 Housing Element*. It includes goals, policies, and programs for the provision of housing in Madera County for the years 1992 through 1997. The *Housing Element* is divided into five major sections. The first, "Resource Inventory and Needs Assessment," discusses population and employment characteristics and trends, household characteristics, and housing stock characteristics. Sections II and III describe constraints on the production

of housing, both governmental and nongovernmental. The next section addresses the County's housing goals, policies, and programs, and the last section assesses existing and past Housing Element goals and objectives.

Goals and policies of the *Housing Element* encourage the construction of housing to meet the county's projected housing needs for very-low-, low-, and moderate-income households; to provide for decent housing for all income levels, including migrant farm worker housing, emergency shelters, and housing for other groups with special needs; to provide for a balance of residents and jobs; to preserve existing residential neighborhoods; and to ensure safe, sanitary housing.

1.3 AREA PLANS

The Madera County General Plan includes several area plans adopted in the late 1970s and early 1980s as follows:

- *North Fork Study Area Plan* (1979)
- *O'Neals Study Area Plan* (1980)
- *Oakhurst-Ahwahnee Area Plan* (1980)
- *Coarsegold Community Plan* (1982)

Two other area plans (*Gunner Ranch West Area Plan* and *Rio Mesa Area Plan*) were also adopted recently. The *Gunner Ranch West Area Plan* was adopted in December 1994 and the *Rio Mesa Area Plan* was adopted in March 1995. A *Draft State Center Community College Specific Plan* was undergoing public review as of October 1995. A draft update of the Oakhurst-Ahwahnee Area Plan was published August 1995 and was also undergoing public review as of October 1995.

The boundaries of these areas are depicted in Figure 1-3. The following discussions summarize the existing area plans as of October 1995.

NORTH FORK AREA PLAN

The *North Fork Area Plan* was prepared by the North Fork Citizens Advisory Committee and adopted by the Board of Supervisors in 1979. The *North Fork Area Plan* establishes three major land use classifications for the North Fork Area and presents goals and policies for each of these classifications.

North Fork/South Fork Community Center Area

This area includes land that is developed or zoned for urban residential, commercial, and industrial land uses within North Fork and South Fork. Goals and policies for the North Fork/South Fork Community Center Area promote this area as the center for urban residential, commercial, and industrial development and public services within the North Fork Area, with limitations due to environmental and public facility constraints. The *North Fork Area Plan* further promotes development of a detailed community plan for this area.

Rural Development Areas

These areas are mainly located north and west of the developed North Fork/South Fork Community Center Area. Under the *North Fork Area Plan*, rural development areas are designated primarily for rural residential development, although limited rural commercial development is also permitted.

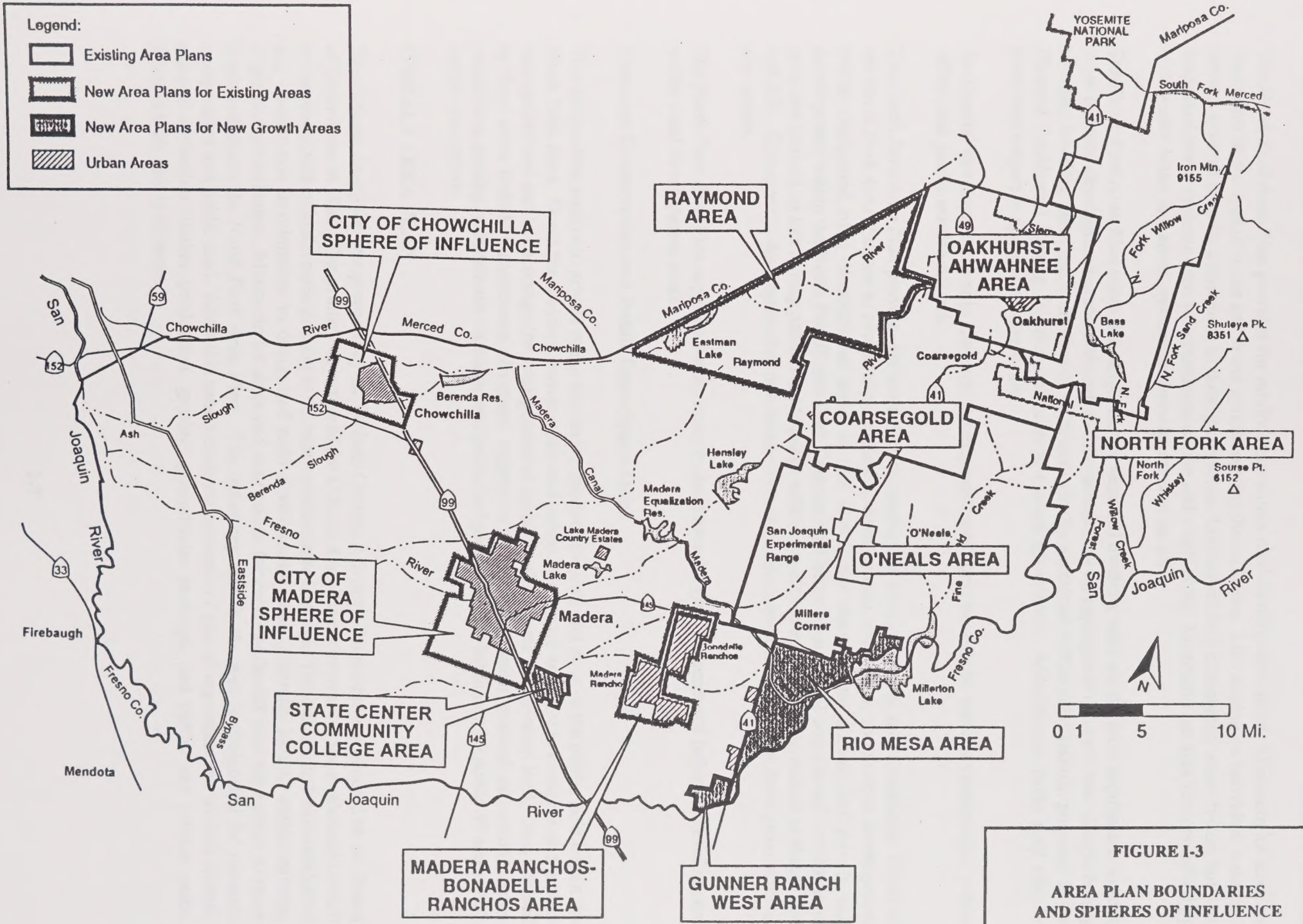
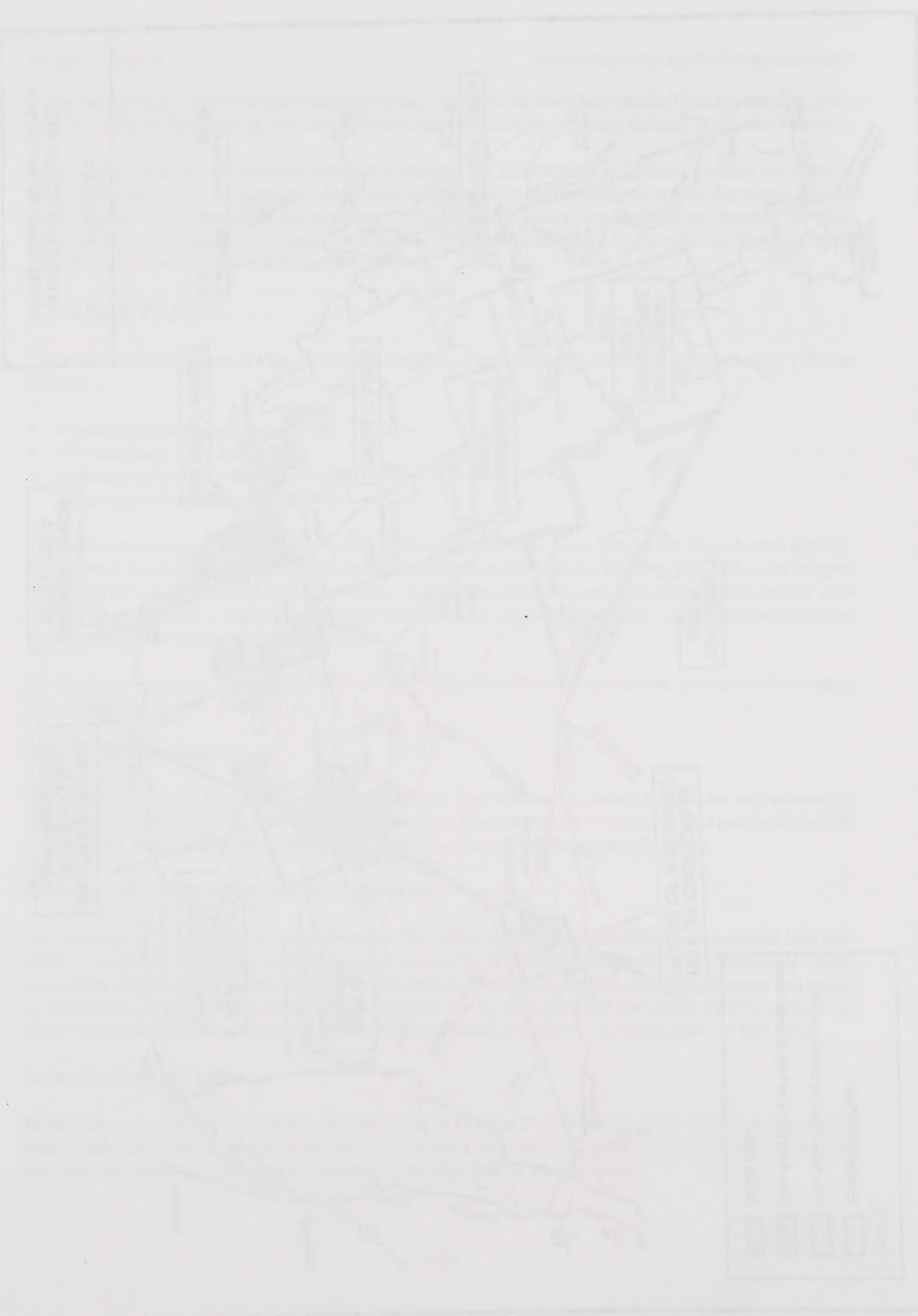


FIGURE I-3

AREA PLAN BOUNDARIES AND SPHERES OF INFLUENCE

Maps Prepared 5/94 by: H. T. Harvey & Associates



The *North Fork Area Plan* provides for subdivisions within rural development areas. Minimum lot sizes are dependent on the type of water and sewer system serving the residence. Lots relying on individual water and sewage systems must be a minimum of three gross acres. Lots served by a community water system but with individual sewer systems must be a minimum of one and a half acres. Minimum net area for lots served by community water and sewer systems is three-quarters of an acre.

The *North Fork Area Plan* states that single family detached dwelling units are the most appropriate housing types for rural development areas, although mobile homes may be appropriate on some lots. Single family attached dwelling units and multi-family units may also be permitted within subdivisions, pursuant to the Planned Residential Zoning District and other site coverage criteria. Mobilehome parks may also be permitted subject to specific requirements.

Residential development within the rural development area must be able to meet environmental, public safety, and public service criteria.

The *North Fork Area Plan* provides for limited rural commercial development at select locations. Goals of the *North Fork Area Plan* are to avoid strip commercial development and to limit commercial development within designated rural development areas so that it will not detract from commercial growth and development within the North Fork/South Fork Community Center Area. Rural commercial development areas are focused on lots having public road frontage within one-eighth mile of the intersection of Roads 200 and 221. Commercial development at this intersection shall not encompass more than three gross acres at any corner.

The *North Fork Area Plan* suggests further study to determine the appropriateness of industrial development within rural development areas.

Resource Conservation and Public Open Space Areas

This designation applies to private range and timber production lands and most of the public land within the North Fork Area. Goals for resource conservation and public open space areas are to conserve and protect appropriate land and to encourage the management of agricultural resource conservation land. Uses allowed in these areas include maintenance of natural vegetation and wildlife habitat, mineral extraction, timber production, grazing, groundwater recharge, and public and private parks. Minimum lot size is 40 acres, with certain exceptions.

O'NEALS AREA PLAN

The *O'Neals Area Plan* was prepared by the O'Neals Citizens Advisory Committee and adopted by the Board of Supervisors in 1980. The primary objective of the *O'Neals Area Plan* is to preserve the area's rural foothill environment and maintain cattle grazing as the area's predominant land use. The plan limits future residential and commercial development to designated rural development areas, generally located within existing approved subdivisions. Minimum lot sizes and restrictions for rural residential uses are similar to those described under the *North Fork Area Plan*. The remaining land in the area is designated for resource conservation and public land. Allowable uses include maintenance of natural vegetation and wildlife habitat, mineral extraction, timber production, grazing, groundwater recharge, and public and private parks. Minimum lot size is 40 acres.

OAKHURST-AHWAHNEE AREA PLAN

The *Oakhurst-Ahwahnee Area Plan* was prepared by the Oakhurst-Ahwahnee Planning Area Citizens Advisory Committee and adopted by the Board of Supervisors in May 1980. The *Oakhurst-Ahwahnee Area Plan* addresses the three unincorporated communities of Oakhurst, Ahwahnee, and Yosemite Forks.

The *Oakhurst-Ahwahnee Area Plan*'s overall goals are to preserve the area's rural nature and low residential density, except in areas specified for urban development. The *Plan* states that high density residential and commercial development should be directed away from rural areas, and provided for only in areas specified for urban development. The *Plan* also directs that new development should not exceed the ability to provide public facilities and services.

The *Oakhurst-Ahwahnee Area Plan* includes goals and policies, along with supporting background discussion, for several topics. These are summarized by topic below.

Rural Atmosphere

Areas suitable for agricultural and rural residential uses should be designated, allowing for residential parcels in varying sizes from 5- to 20-acre minimums. Designated community center residential zones should allow greater building density. Mid- to high-density residential development should be encouraged to locate within community service areas or districts. Specific areas should be designated for low density rural subdivisions (minimum three-acre parcels).

Environmental Protection

Policies under this topic promote architectural review, landscaping with natural vegetation, protection of native trees, regulation of cut-and-fill and grading operations to minimize erosion, preservation of identified natural habitats, planned development and clustered housing, prohibition of development in designated floodways, and economic incentives to promote non-polluting alternative energy sources.

Water Supply

Based on concerns over water supply and water quality problems resulting from the use of on-site (septic tank) sewage systems, the *Plan* calls for guarantees of water availability prior to development approval strict enforcement of County water and water quality ordinances, and requiring minimum 2½-acre parcel sizes for residential units using well and septic systems.

Community Identity

Policies to retain the communities' small town character include establishment of an architectural review committee, preservation and rehabilitation of culturally-significant sites, and establishment of geographic limits to define commercial and residential areas.

Housing

Policies include provision of a wide variety of residential uses, encouraging medium- and high-density developments within existing community service centers and designated expansion areas and promotion of self-contained planned unit developments.

Industrial Development

The *Plan* supports the designation for and development of light, non-polluting industries, which are not water-use-intensive, to serve the employment needs of current area residents.

Commercial Development

The *Plan* promotes concentration of commercial development in central commercial areas to serve local needs, as well as highway-oriented commercial uses for use by tourists.

Recreation

The *Plan* includes policies for inventorying historically- and archaeologically-significant sites, supports a long-range plan for the acquisition of recreational areas and public use areas to the Fresno River, and promotes establishment of standards for recreational facilities within large subdivisions and central community areas.

Safety

The *Plan* includes policies to reduce the risks of fire, erosion, and landslide hazards, including development of a central water system for the community center of Oakhurst, establishment and enforcement of fire flow and other fire protection standards, and development of building density guidelines for variable slopes.

Traffic Circulation

The *Plan* includes policies to alter roadway and parking methods to reduce traffic hazards, to promote traffic signals to allow for safer pedestrian cross walks, and to require new development to provide for adequate roadway conditions.

Scenic Routes

Policies of the *Plan* include appointment of a citizens advisory committee to identify scenic corridors and to recommend minimum criteria for their protection and establish specific controls along scenic routes.

Plan Amendments

The *Plan* states that amendments should serve the interests of the general public and should not undermine established community goals.

Citizen Participation

The *Plan* supports the establishment of panels or committees to advise County officials on specific planning issues and encourages public availability of reports and information used in making planning decisions.

The *Oakhurst-Ahwahnee Area Plan* was in the process of being updated as of October 1995. A draft of the updated plan and Draft EIR were published in late summer of 1995; the update plan was scheduled for adoption in late 1995 or early 1996.

COARSEGOLD AREA PLAN

The *Coarsegold Area Plan* was prepared by the Coarsegold Citizens Advisory Committee and adopted by the Board of Supervisors in December 1982. The plan area encompasses approximately 60,000 acres. The *Coarsegold Area Plan* designates land for agriculture with agricultural or range land uses, including all lands under Williamson Act contract.

Rural residential development is permitted on lots of a minimum two and one-half acres, although density averaging is permitted for residential subdivisions. Commercially-designated land includes the current Coarsegold community center, and other select intersections. Industrial development is permitted west of Highway 41, approximately one mile north of its intersection with Road 417.

GUNNER RANCH WEST AREA PLAN

The Gunner Ranch West Area encompasses approximately 1,150 acres and is located immediately to the west of Highway 41, bounded by the San Joaquin River bluffs to the south.

The *Gunner Ranch West Area Plan* proposes a 500-bed Valley Children's Hospital and associated ancillary facilities on a 50-acre site; medical offices; residential uses; and other office, commercial, and open space uses.

RIO MESA AREA PLAN

The Rio Mesa Area is located along the southeast border of Madera County immediately north of the city of Fresno metropolitan area. The Rio Mesa area encompasses approximately 15,000 acres, is bounded by State Route 41 on the west, the San Joaquin River/Fresno County line on the southeast, State Route 145 on the north, and Millerton Lake Recreation Area on the east.

The *Rio Mesa Area Plan* proposes a mix of residential, commercial, and industrial, and open space uses. The area was once considered as one of three potential sites for a new University of California campus in the San Joaquin Valley; however, a site in Merced County was selected.

STATE CENTER COMMUNITY COLLEGE SPECIFIC PLAN

The State Center Community College Area encompasses approximately 1,800 acres and is located east of Highway 99, southeast of the city of Madera. This area is proposed as the site of the new State Center Community College and residential, commercial, and industrial uses. Due to its location, if approved by the County, the area may ultimately be annexed to the City of Madera; however, most of the area is not currently within the City's sphere of influence and urban development in the city is not likely to extend to this area for some time.

The *Draft State Center Community College Specific Plan* and *Draft EIR* were published in mid-1995 and are scheduled for adoption in late 1995.

1.4 ZONING

The *Madera County Zoning Ordinance* sets forth zoning regulations for unincorporated areas of the county. The *Zoning Ordinance* regulates land uses, building height, setbacks, provision of open space, and other factors that relate to development on individual properties.

Under State law, cities and counties have broad latitude in establishing zoning standards and procedures. One key requirement, however, is that zoning regulations be consistent with the general plan.

SUMMARY OF ZONING DISTRICTS

The *Madera County Zoning Ordinance* provides for a total of 40 zoning districts, plus three overlay districts. Included in this total are districts that provide varying regulations within the same basic zoning district; for example, the RRS-2 and RRS-5 districts are variations on the RRS (residential, rural, single family) zone.

The following is a brief summary of the basic zoning categories as of October 1995. This summary outlines only general standards and is provided for reference purposes only. The *Zoning Ordinance* itself should be consulted for specific questions regarding permitted, accessory, and conditional uses, and other regulations.

Agricultural Zones
(AR-5, ARE-20, ARE-40, ARE-80, ARE-160, ARE-320, ARE-640, AEX-40, ARV-20, ARF)

Several zones provide for agricultural uses, including the Agriculture Rural (AR), Agriculture Rural Exclusive (ARE) zones, Agricultural Exclusive (AEX) zones, Agricultural Rural Valley (ARV), and Agricultural Rural Foothill (ARF) zones. The suffix of the zoning district generally indicates the minimum lot acreage; although suffix numbers are rounded to the closest factor of 10 (for instance, the minimum lot size for the ARE-40 zone is 36 acres).

The AR, ARE, ARV, and ARF zones permit single-family dwellings in addition to agricultural uses.

AEX zones permit agricultural uses, and, with a zoning permit, allow for one single family manufactured home for occupancy by indigenous agricultural workers. Additional single-family manufactured homes for occupancy by indigenous agricultural workers are allowed with a conditional use permit.

Residential Zones
(RUS, RUM, RRS, RRS-2, RRS-2½, RRS-5, RRS-10, RRM, RMS, RUM, -RM)

The *Zoning Ordinance* provides for three broad categories of residential zones. These zones permit residential uses at varying densities. The two urban residential zones (Rural-Urban-Single Family and Rural-Urban-Multiple Family) provide for the highest densities and provide for single-family and multi-family uses, respectively. The highest allowable residential density of one dwelling unit per 2,500 square feet of lot area is permitted in the RUM zone. The County is considering some increases in allowable densities for the RUS and RUM zones.

The residential rural zones allow for single-family (RRS) and multi-family (RRM) development with large lot sizes. The suffix of each RRS zone specifies the minimum lot area in acres; for example, the minimum lot area in the RRS-2 zone is two acres. The RRM zone allows single- and multiple-family residential uses, and requires a minimum of one acre per dwelling unit.

There are three rural mountain zones (RMS, -RM, RMM). The RMS and -RM provide for single family and agricultural uses. The RMS zone also allows for forestry uses. The -RM (Rural Mountain) zone allows for one single-family home, a second single-family unit for occupancy by a relative or agricultural worker, with a minimum two-acre lot size.

Commercial Zones
(CUG, CRG, CUM, CRM, CUR, CRR, CRH)

These zones (Commercial-Urban-General; Commercial-Rural-General, Commercial-Urban-Median, Commercial-Rural-Median, Commercial-Urban-Restricted, Commercial-Rural-Restricted, and Commercial-Rural-Highway, respectively) allow various types of retail and other commercial uses. The CUR and CRR zones allow specified residential uses by right. The other zones permit single-family residential uses with a zoning permit.

Industrial Zones
(I-L, I-H)

These two zoning districts (Industrial-Urban or Rural-Light and Industrial-Urban or Rural-Heavy) permit light and heavy industrial uses, as well as general commercial uses. These zones also permit single- family residential uses with a zoning permit.

Planned Districts
(PRA, PRD, PSC, PCD, PIP)

Five planned zoning districts are intended to accompany a site plan for a development site. The site plan must address land use, landscaping, sign controls, and infrastructure, including drainage, fire control, water system, and sewerage. Planned zones require site plans for a five-acre minimum lot. Planned zones include Planned Recreation (PRA), Planned Residential Development (PRD), Planned Shopping Center (PSC), Planned Commercial Development (PCD), and Planned Industrial Park (PIP).

Timber Preserve Zones
(TPZ)

The TPZ district permits agriculture, barns and corrals, forestry, and one single-family dwelling per lot. Minimum lot size is 160 acres.

Open Space Zones
(OS, POS)

Two zoning districts are designed to protect open space. The Open Space (OS) zone provides for agriculture, golf courses, canals, transmission lines, and allows one single family dwelling unit per farm with a zoning permit. The POS (Public Open Space) zone allows for publicly-owned uses (except institutional uses), areas under public control, agriculture, forestry, grazing, and public airports.

Other
(QMD, IA)

The QMD (Quarry, Mining, and Drilling) zone permits quarrying, mining, and drilling.

The IA (Institution Area) zone is intended exclusively for public facilities and institutional uses such as schools, churches, and other public buildings.

Overlay Zones
(AAO, SHO, MHA)

Three overlay districts are applied to specific area of the county in addition to the primary zoning district in order to specify additional regulations on top of other zoning district regulations. Overlay districts include the AAO (Airport/Airspace Overlay), SHO (Scenic Highway Overlay), and MHA (Manufactured Housing Architectural Review Overlay). The County is considering a new overlay zone to allow for second single family residences on lots of 30,000 square feet or more.

1.5 EXISTING LAND USES

COUNTY LAND USE

The total land area of Madera County is approximately 2,147 square miles or nearly 1.4 million acres. The two most important factors affecting land use patterns in the county are geographic conditions and political jurisdictions. Geographic conditions, particularly climate, topography, and vegetation, create three recognizable and distinct geographic units within Madera County: Valley, Foothills, and Mountains.

Madera County is home to two incorporated cities: Chowchilla and Madera. Land outside municipal (city) boundaries lies within the county and is referred to as "unincorporated" land. Over a third of the county's land is under federal ownership; most of this is in the Sierra and Inyo National Forests and Yosemite National Park. Table 1-1 presents the distribution of total county acreage by political jurisdiction. As the table shows, less than one percent of the land in the county is incorporated, with the remaining 99 percent unincorporated land. Nearly 40 percent of the county is in federal ownership. This means that the County retains land use control over about 60 percent of the land in Madera County

TABLE 1-1

DISTRIBUTION OF CITY AND COUNTY LAND
Madera County
1992

Jurisdiction	Square Miles	Percent of County Total
Incorporated		
Chowchilla	4.0	0.2%
Madera	10.1	0.5%
Incorporated subtotal	14.1	0.7%
Unincorporated subtotal	2,132.9	99.3%
Federal lands	852.6	39.7%
Non-federal unincorporated land	1,280.3	59.6%
Total	**2,147.0**	**100.0%**

Source: Office of Planning and Research, 1994; *California Almanac,* 1991

HISTORICAL LAND USE BY GEOGRAPHIC AREA

Historically, land use patterns in Madera County have been closely related to the natural characteristics of the county's main geographic areas. Each of the three major geographical units (Valley, Foothills, and Mountains) has provided a context for the development of its own set of industries and land use patterns. The industries associated with each area are typically resource-based industries which are non-transferable economic activities; that is, they are highly dependent upon the preservation of local land use conditions. For example, the cultivation of vineyards and orchards--a major industry in Madera County--is dependent on the deep rich soils of the valley in order to thrive, and the timber industry is dependent on the forests in the higher elevations of the east county. The grasslands of the foothills have traditionally been fine grazing lands. In recent years, however, as a result of advances in agricultural technology, cultivated agriculture has been moving into the foothills where the soils and topography precluded this kind of agriculture in the past. From a planning perspective, traditional land uses are important because they provide the foundation for the county's economy, its livelihood, and its character.

The Valley

The western third of the county is part of the San Joaquin Valley. Madera County has been, and continues to be, a predominantly rural, agricultural county. Two kinds of agricultural activity occur in the county: intensive agriculture, which refers to the cultivation of crops (field, seed, vegetable, fruit and nut), nursery stock, and apiary (bee and honey) products; and extensive agriculture, a category which includes livestock ranching and all aspects of animal husbandry.

The Valley area, which consists of rich alluvial bottom lands of the San Joaquin Valley, is predominantly agricultural in character. Most of the intensive agriculture in the county occurs here, due to its level topography, prime cultivable soils, and excellent drainage.

Madera County's two incorporated cities are located on Valley lands: Chowchilla in the north and Madera in the central southern part of the county. Chowchilla is a rural community whose local economy is closely linked to agricultural production. Madera is a larger city which, together with significant public and industrial sectors, continues to have strong ties to agricultural production. The unincorporated community of Fairmead and the Madera Ranchos/Bonadelle Ranchos areas are also located in the Valley.

The Foothills

The Foothills region is used for grazing and increasingly, for urban land uses. Extensive agriculture (irrigated pasture, grazing, and animal husbandry) is a major land use in the county. The duration of this activity is somewhat fluid and dependent upon the availability of suitable grazing areas, vegetation, and climatic conditions (e.g, availability of water).

Urban uses in the Foothills are concentrated in and adjacent to the unincorporated communities of Raymond, Oakhurst, Coarsegold, and Yosemite Lakes. Much of the new development is fueled by retirees from more urbanized regions of California, and workers who commute to jobs in the greater Fresno area. The recreational opportunities, relatively low land and housing costs, and "rustic" wooded environment are attractions for settlement in the Foothills.

The Mountains

Land use in the Mountains area reflects the area's abundance of natural resources. Chief among these are forests, water, and wildlife. The area's scenic beauty has also created the base for an important tourism and recreation industry.

Pine and fir forests ("timberlands") cover approximately 400,000 acres in the Mountains area of the county and provide for the county's wood products industry. The community of North Fork is highly dependent on lumber and wood-processing. The mountains and forests also contain significant wildlife habitats and watershed areas.

Outdoor recreation areas include portions of the Sierra and Inyo National Forests, as well as the Ansel Adams and John Muir Wilderness Areas, Yosemite National Park, Devils Postpile National Monument, the Millerton Lake State Recreation Area, and Bass Lake. Although no major urban settlements are located in the Mountains, smaller communities of North Fork and Bass Lake are located within the Mountain region, with their economic base linked to timber production and tourism, respectively.

GENERALIZED DESCRIPTION OF EXISTING LAND USE

The existing land use information described here is based on the land use inventory prepared as part of the *Housing Element*. Table 1-2 presents approximate existing land use acreage by generalized land use categories.

TABLE 1-2

GENERALIZED LAND USE CATEGORIES
Madera County
1990

Category	Percentage of Land Uses*
Agriculture	46%
Residential (vacant and developed, including rural farm and ranch residences)	6%
Commercial	<1%
Industrial	1%
Public lands, opens space and recreational	44%
Other vacant	3%

* Does not include incorporated cities

Source: *Madera County Housing Element*, September 1993

1.6 CITY GENERAL PLANS

Madera County contains two incorporated cities: Chowchilla and Madera. Each city has an adopted General Plan to guide development within the city limits and within the city's larger planning area. The following discussion briefly describes the provisions of each city's general plan, particularly those relevant to the Madera County General Plan and countywide land use and development issues.

CITY OF MADERA GENERAL PLAN

The City of Madera is located in the valley area of Madera County. Madera is the county's largest city with a population of 33,027 as of January 1993 and is the county seat. State Route 99 bisects the city. State Route 145 runs in a north-south direction west of Highway 99 and runs east-west east of Highway 99, connecting to State Route 41. The Fresno River bisects Madera in an east-west direction.

The City of Madera adopted a comprehensive update of the its General Plan in October 1992. The *Madera General Plan* planning area encompasses all land within the city's sphere of influence. According to the plan, this includes all land within the existing city limits, additional area expected to urbanize over the next 20 years (generally anticipated for annexation), and additional unincorporated area within the county. The City of Madera's Land Use Diagram covers only the area expected to urbanize over the next 20 years.

The *Madera General Plan* assumes population growth in the range of 41,570 to 50,290 by 2000, and in the range of 61,520 to 74,440 persons by the year 2010. This includes population growth through annexation of existing unincorporated development as well as by new development.

The *City of Madera General Plan* includes seven major goals that address the quality and rate of development in the city. These seven goals are summarized as follows:

1. Expand job-creating and revenue-generating activities to balance the benefits and costs of urbanization;
2. Provide for equal opportunity in jobs, housing, and public services;
3. Manage the rate of growth within the capacity of the city, school district, and other agencies to provide the necessary levels of community services and facilities;
4. Enhance the quality of life for present and future generations by preventing the degradation of the natural and man-made environment;
5. Phase the ultimate expansion of the city to create a physical form and character which improves the ways in which the community functions and is enjoyed; and
6. Regulate new development to reflect high levels of community appearance and image;
7. Improve the physical character and economic base of the Central Business District.

The issue discussion and policies of the *City of Madera's General Plan* are grouped by major subheading. Major issues and policies are summarized here according to those topics.

Rate and Extent of Future Population Growth

The City of Madera's planning area encompasses the entire Madera urban area, including unincorporated development outside the city limits. Only two-thirds of the urban area's population lies within the city limits. The plan states that "[w]hile policies of the County discourage new subdivision development by requiring centralized water and sewer systems (in effect, annexation to the City), the number of undeveloped lots in existing subdivisions is sufficient to result in continued growth for the better part of the 1990s." The Plan assumes buildout of these lots before the year 2000.

The *City of Madera General Plan* also anticipates continued industrial development and associated residential development. Policies relating to the rate and extent of future population growth direct the City to tie housing growth in Madera to job growth in the local and regional economy, and to monitor population growth if it exceeds four percent annually to assure the provision of adequate service levels.

Annexation to the Urban Development Boundary

The City's Urban Development Boundary (UDB) encompasses the area where urban development is expected to occur over the next five years (e.g., by 1997). The *Plan* notes that "within the UDB, development proposals can be accepted and approved only in accordance with policies of the General Plan," presuming annexation to the city. The *Plan* presumes an expansion of Madera's UDB to accommodate ten years of urban expansion, and includes a policy to develop "an aggressive program, with the cooperation of LAFCO and the County, to annex lands out of the [expanded] UDB which will be needed over the next 10 years. . . ."

Development Phasing and the Comprehensive Annexation Plan

Policies in the *Plan* provide for phasing to avoid fragmentation of the urban pattern, promote infill development, and suggest adoption of a Comprehensive Annexation Plan.

Revitalization

The Plan includes a policy to address revitalization and rehabilitation through the redevelopment process.

Population and Economic Policies

Population and economic policies of the *Madera General Plan* promote diversification of employment opportunities in Madera through industrial and commercial expansion of both agriculturally-related and non-agricultural industries, while promoting environmental and public health protection. The Plan also provides for strengthening and supporting existing industries and commercial operations.

Land Use Development Policies

The *Madera General Plan* promotes the development of specific plans and neighborhood plans to address areas of vacant residential land within the planning area. The *Plan* provides for multi-family housing close to commercial centers. The *Plan* further provides for revitalization of the Central Business District, designates land for mixed uses within the Redevelopment Project Area, and designates the area in the triangle formed by the airport, Highway 99, and Avenue 16 for service commercial uses for development of businesses to support industry and/or service needs of other commercial activities.

The *City of Madera General Plan* also includes policies regarding the proposed State Center Community College, currently part of an area plan being undertaken by Madera County. The *City of Madera General Plan* states the City's support for the proposed location of the new community college, and suggests actions to amend the City's sphere of influence to include this area.

CITY OF CHOWCHILLA GENERAL PLAN

The City of Chowchilla is located on State Highway 99 in the northern part of Madera County. As of January 1993, the city had a population of 6,631, according to California Department of Finance estimates.

The *City of Chowchilla General Plan* was adopted in 1986, and consists of six elements: Land Use, Circulation and Transportation, Housing, Noise, Safety, and Open Space, Recreation, and Conservation. The existing General Plan Land Use Map shows land use designations for an area extending beyond the city limits within its sphere of influence. In 1991, the City annexed 1,500 acres, and therefore contains sufficient land to accommodate growth for some time. In total, the *Chowchilla General Plan* provides for a buildout holding capacity of over 20,000 population. Land within the city's sphere of influence could accommodate a substantially higher population.

Relevant policies of the *Chowchilla General Plan* promote urban development only upon annexation to the city which can be served with city services, emphasize infill development, and seek to manage the location, extent, and timing of urban growth within the planning area to be compatible with the economy and natural resources of the area and the urban service capabilities of the City. The Plan includes policies to coordinate with the County in planning for and regulating the use of land in the unincorporated portions of the planning area.

Since 1992, the City has annexed two large areas to the east and west of the city, and adopted the *Greenhills Golf Course and Country Club Specific Plan* for a large area east of State Route 99.

As of 1995, the City is in the process of updating its General Plan to cover an area larger than its current sphere of influence.

In 1992, legislation was introduced in the State Legislature that would allow for an island annexation of the Central California Women's Facility (State prison) to the City of Chowchilla (AB 944 - Costa). Special state legislation is required to allow island annexations because annexations are normally required to be contiguous to a city limits, although Local Agency Formation Commissions (LAFCOs) retain ultimate approval over annexations. Such annexations benefit cities because the cities then become the recipient of state subvention funds which are based on population.

The Chowchilla legislation did not pass during the 1992 session and was not reintroduced in 1993, although such a bill could be reintroduced in the future. This type of legislation has enjoyed a high degree of success in the past. Several such island annexations of state prisons have taken place since 1989, including Soledad, Blythe, Susanville, Pelican Bay (Crescent City), and Calipatria.

1.7 LAFCO AND SPHERES OF INFLUENCE

LAFCO RESPONSIBILITIES

In 1985, the Cortese/Knox Local Government Reorganization Act (*Government Code* Section 56000) consolidated the various state laws regulating city and special district organization and annexations. The Cortese/Knox Act superseded the 1963 Knox-Nisbet Act, which created local agency formation commissions (LAFCOs) in each county in California to regulate the organization and extension of services provided by cities and special districts.

The Knox-Nisbet Act declares that "among the purposes of the commission are the discouragement of urban sprawl and encouragement of the orderly formation and development of local agencies based upon local conditions and circumstances. One of the objects of the commission is to make studies and to obtain and furnish information which will contribute to the logical and reasonable development of local agencies in each county so as to advantageously provide for the present and future needs of each county and its communities" (*Government Code* Section 56301). In meeting these responsibilities, each LAFCO is required "to review and approve or disapprove, with or without amendments, wholly, partially, or conditionally, proposals for changes of organization or reorganization" (*Government Code* Section 56475(a)).

According to *Government Code* Section 56201, "change of organization" means any of the following:

- A city incorporation
- A district formation
- An annexation to, or detachment from, a city or district
- A disincorporation of a city
- A district dissolution
- A consolidation of cities or special districts

Government Code Section 56036 defines the special districts that fall under LAFCO jurisdiction. School districts and redevelopment agencies, among others, are not included within this definition and are therefore not subject to LAFCO review.

In addition to its regulatory responsibilities, LAFCO is empowered to initiate and to make studies of existing governmental agencies. These studies include, but are not limited to, inventories of local agencies and determination of their maximum service areas and service capabilities.

SPHERES OF INFLUENCE

As the basis in part for making decisions about organizational changes and annexations, LAFCO must adopt a "sphere of influence" (SOI) for each local agency subject to LAFCO regulation. The Cortese/Knox Act defines a sphere of influence as "a plan for the probable ultimate physical boundaries and service area of a local agency" (*Government Code* Section 56076). In practice, "ultimate" is typically defined as 20 years. The SOI determination includes the identification of "Urban Service Area" boundaries, which identify areas within a city's sphere of influence that are served by urban facilities, utilities, and services or that are proposed to be served during the first five years of an adopted capital improvement program. These boundaries must be adopted in cooperation with the affected cities. Once LAFCO adopts the boundaries, it may not deny a city's annexation of land that falls within an identified "urban service area boundary."

In determining the sphere of influence of each local agency, LAFCO must consider and prepare a written statement of its determinations with respect to each of the following:

- The present and planned land uses in the area, including agricultural and open space lands.
- The present and probable need for public facilities and services in the area.
- The present capacity of public facilities and the adequacy of services which the agency provides or is authorized to provide.
- The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency (*Government Code* Section 56425).

Once these spheres are adopted, LAFCO decisions must be consistent with applicable spheres (*Government Code* Section 56377.5). This means that LAFCO may not approve city annexations outside the adopted sphere of influence for the city.

SPHERES OF INFLUENCE IN MADERA COUNTY

The Madera County LAFCO has adopted spheres of influence for the cities of Chowchilla and Madera. Figure 1-3 shows the boundaries of these spheres of influence.

1.8 OTHER CITY, COUNTY, AND REGIONAL PLANS AND POLICIES

This section reviews other plans which may affect development in Madera County, including surrounding counties and cities, and regional plans, and summarizes relevant issues and policies which may have implications for the Madera County General Plan.

Plans reviewed in this section include studies related to Madera County, including the County's *Highway 41 Corridor Study* and the *San Joaquin River Parkway Plan.* These two studies are not adopted County plans but instead make recommendations for inclusion in future planning. The section also reviews the surrounding county plans (Fresno, Merced, and Mariposa Counties), nearby cities' general plans (Fresno, Clovis, and Firebaugh), and plans by other agencies, including the *Sierra National Forest Land and Resource*

Management Plan, the San Joaquin Valley Unified Air Pollution Control District's *Air Quality Attainment Plan*. This section also reviews specific functional plans in Madera County, including the *Regional Transportation Plan*, the *Airport Land Use Compatibility Plan*, the *Integrated Solid Waste Management Plan*, and the *Hazardous Waste Management Plan.*

HIGHWAY 41 CORRIDOR STUDY

The *Highway 41 Corridor Study*, completed in June 1989, is a study of land use and related transportation issues of the Highway 41 corridor in Madera County. Highway 41 serves as the primary access route to and from the Fresno metropolitan area for residents of eastern and southeastern Madera County and as a primary access to Yosemite National Park and the Sierra National Forest. The *Highway 41 Corridor Study* was prepared by the Highway 41 Corridor Study Advisory Committee and County Planning Department for the Madera County Transportation Commission. Figure 1-4 shows the boundaries of the Highway 41 Corridor Study Area. The *Highway 41 Corridor Study* included several recommendations concerning future land use and transportation planning within the Highway 41 corridor. Specific recommendations address acquisition of adequate right-of-way to accommodate future roadway expansions. These recommendations are described in Chapter 3, *Transportation.* Other recommendations are summarized below.

- A specific plan should be developed for the area from the San Joaquin River to Highway 145 and from Millerton Lake to Road 35 and its northern alignment. (This area is roughly the area being considered under the Rio Mesa Area Plan). This study should include examination of a viable east-west expressway.

- Developers should pay the direct and indirect costs of infrastructure (particularly roads) impacted by new development.

- Traffic volumes within the Highway 41 Corridor Study Area should be reviewed by the Madera County Road Department on a semi-annual basis.

- The citizens of Madera County should pass a retail transactions and use tax initiative for road maintenance, rehabilitation, and construction. (This initiative was subsequently passed in Madera County).

SAN JOAQUIN RIVER PARKWAY PLAN

The *San Joaquin River Parkway Pl*an was adopted by the San Joaquin River Parkway Task Force, an advisory body created by state statute in 1990. The *Parkway Plan*, completed in March 1992, is a conceptual, long range planning document intended to help preserve, enhance, and provide for enjoyment of the natural landscape of the San Joaquin River corridor. The proposed parkway would include the San Joaquin River and approximately 5,900 acres of land on both sides of the river between Friant Dam and the Highway 99 crossing, as well as the existing 17-acre Skaggs Bridge Regional Park at the Highway 145 crossing. Approximately 1,900 acres of the parkway would be located in Madera County and 4,000 acres in Fresno County.

Portions of the proposed parkway are currently managed for recreational or natural resource protection, conservation, and education purposes, although other parts are privately owned and used for other purposes. Approximately 4,650 of the 5,900 acres within the proposed parkway are not publicly owned land. Decisions regarding future acquisition and management of lands within the parkway will be made by the governing

entities with jurisdiction over lands within the parkway area (Madera County, Fresno County, and the City of Fresno) or by a new multi-agency managing entity (e.g., San Joaquin River Conservancy).

The *Parkway Plan* includes the following six fundamental goals:

- Preserve and restore a riparian corridor of regional significance along the San Joaquin River from Friant Dam to the Highway 145 crossing.
- Protect wildlife species that depend on or prefer the river environment for at least part of their existence.
- Provide for conservation, education, and recreation, particularly a continuous trail, in a cooperative manner with affected landowners.
- Protect irreplaceable natural and cultural resources in a way that will also meet people's recreational and educational needs.
- Protect existing undeveloped areas of the riverbottom, which should remain nonurbanized and be retained in open space or agriculture if feasible.
- Provide land use and management policies for the San Joaquin River and areas of the riverbottom included in the parkway that will enhance the attractiveness of the Fresno-Madera metropolitan area and enhance the quality of life of its residents.

More specific goals, objectives, and policies are included in various elements. These include a Land Use Element, that defines land use designations used in the *Parkway Plan* and includes goals, objectives, and policies for natural resources, flood management, and recreation areas. The *Parkway Plan* also includes a Mineral Resources Element, a Plan Implementation Element that addresses land acquisition and a parkway managing entity. The *Parkway Plan* also addresses other land uses, including agriculture, commercial services, and public services facilities.

As a result of the *San Joaquin River Parkway Plan*, the San Joaquin River Conservancy was created in 1993 to acquire, manage, and operate parkway lands.

FRESNO COUNTY GENERAL PLAN

Fresno County borders Madera County on the south and west, so adjacent land uses can affect conditions in Madera County. The *Fresno County General Plan* sets forth land use and development policies in Fresno County.

The *Fresno County General Plan* was adopted in 1976 and is periodically amended and revised. The *Plan* is organized into four major sections: 1) introduction, 2) statement of development policies, 3) general plan elements, and 4) subregional plans.

Overall goals of the *Fresno County General Plan* are to protect agricultural land and discourage urban and other intensive development on productive or potentially productive agricultural land. Related goals promote the concentration of urban and other intensive development around existing urban centers and encourage proposals for urban development in the unincorporated fringes of cities to be annexed prior to development. Generally, the *Fresno County General Plan* designates land adjacent to Madera County for agriculture in the southern and western boundaries, and for open space and forestry uses in the southeast part of the county.

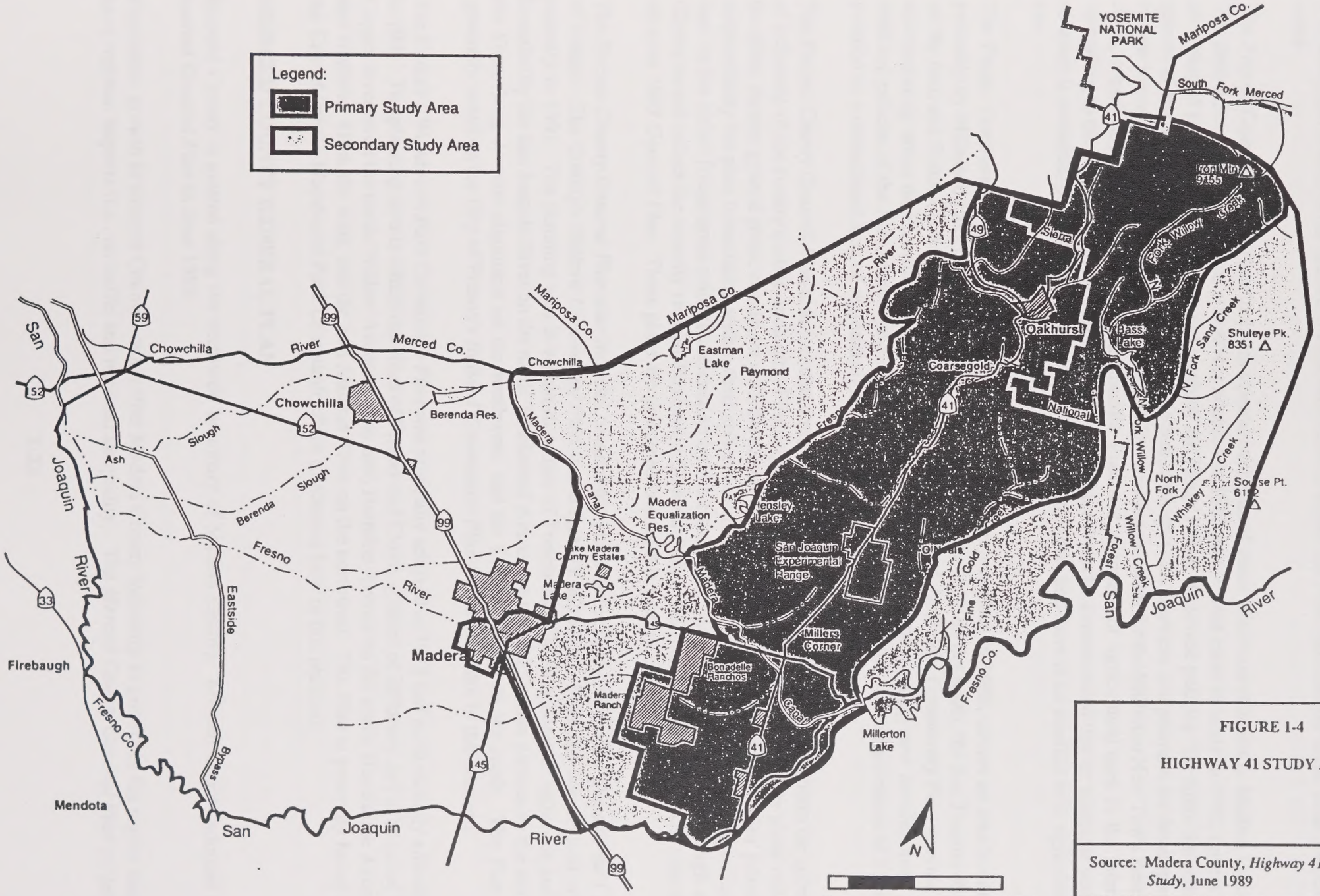


FIGURE 1-4

HIGHWAY 41 STUDY AREA

Source: Madera County, *Highway 41 Corridor Study*, June 1989

Maps Prepared 8/93 by: H. T. Harvey & Associates

The exception is around the cities of Fresno and Clovis, where the *Plan* provides for some rural residential areas.

The *Fresno County General Plan* includes several subregional plans which are relevant to Madera County. The *Sierra-North Regional Plan*, which was adopted in 1982 and revised most recently in 1992, covers the area east of the Friant-Kern Canal and north of the Kings River. Relevant policies "facilitate the orderly growth of the area by the provision of reasonable public facilities and services and promote the development of new towns at appropriate locations." Specifically, the *Plan* provides for the Millerton New Town Reserve Area, which requires development of a Specific Plan and is zoned for agricultural uses in the interim. According to the *Plan*, new towns may be appropriate where it can be demonstrated that an adequate source of water is available, public facilities and services can be provided, and there is no conflict with agricultural use.

The *Friant Community Plan*, adopted in 1964 and most recently revised in 1983, covers an area bounded generally by Millerton Lake on the north, the County's Lost Lake Park on the south, the San Joaquin River on the east, and Friant Elementary School on the west. Policies of the *Friant Community Plan* provide for concentrating urban development by encouraging infill development and phasing new development. In addition, policies of the *Plan* encourage preservation of prime agricultural land and enhancement of Friant's position as a recreational area of regional significance.

The *Fresno County General Plan* also includes community plans which address land uses within the spheres of influence of the county's cities, including Firebaugh, Clovis, and Fresno. Generally, these plans reflect the cities' current general plans, consistent with the county's adopted policy of respecting the cities' primary responsibility for plan formulation within their spheres of influence. The County encourages agricultural uses in the cities' fringe areas prior to annexation by the cities. The community plans for Firebaugh and Clovis do not reflect the recently revised *Firebaugh General Plan* (1992) and the City of Clovis' recently adopted *1993 General Plan*. These plans are discussed later in this section.

The *Fresno County General Plan* also includes community plans that reflect community plans of the City of Fresno. The County's *Bullard Community Plan* was originally adopted in 1964 and was revised most recently in 1991. The planning area is within the cities of Fresno and Clovis spheres of influence and is bounded by the San Joaquin River on the north, Blackstone Avenue on the east, Ashlan Avenue on the south, the Gettysburg Avenue alignment on the southwest, and the City of Fresno on the south. The *Plan* is generally based on the City of Fresno's *Bullard Community Plan* (discussed later in this section).

The County's *Woodward Park Community Plan* was originally adopted in 1979 and most recently amended in 1991. The planning area is within the cities of Fresno and Clovis spheres of influence and is bounded by Copper Avenue on the north, Willow Avenue on the east, Herndon Avenue on the south, Blackstone Avenue and Highway 41 on the west, and the San Joaquin River on the northwest. The *Plan* is generally based on the City of Fresno *Woodward Park Community Plan* (discussed later in this section).

MERCED COUNTY GENERAL PLAN

Merced County is located along the northwest boundary of Madera County. Merced County adopted its current *General Plan* in June 1989.

Population growth in Merced County could affect Madera County indirectly as growth in the region could have regional impacts (i.e., on traffic and regional air quality). The *Merced County General Plan* projects

that countywide population will increase from 166,404 in 1987 to 238,209 in 2000, for an average annual increase of 3.4 percent.

Merced County's primary land use policy is an "urban centered concept." Under the urban centered concept, urban expansion is directed to existing cities and unincorporated communities or centers based on their ability to furnish public services, while rural areas are protected for open space and agricultural uses. The *Merced County General Plan* therefore categorizes land use into urban and rural categories. Rural areas are divided into two land use designations: Agricultural and Foothill Pasture.

The Agricultural land use designation is applied to non-urban lands on the valley floor while the Foothill Pasture designation is applied to lands on the Sierra Nevada Foothills to the east and the Diablo Range to the west. The Agricultural designation is intended to provide primarily for cultivated agriculture and related uses, while the Foothill Pasture designation is intended to allow for noncultivated agricultural practices which require larger areas of land due to soil quality, limited water availability, and steeper slopes. Other uses allowed in both designations include livestock facilities, wastewater lagoons, agricultural commercial facilities, mineral resources extraction and processing, outdoor public and private recreational facilities, and housing as an accessory use to the primary activity of the site (may include manufactured or conventional single family dwelling units or group quarters for farm laborers). The Agricultural designation allows for one home per 20 acres.

The *Merced County General Plan* designates urban land into four types of boundaries or centers. Specific Urban Development Plan (SUDP) areas allow all urban and rural land use designations and are applied to cities and unincorporated communities. The other three centers are oriented to specific types of uses. Rural Residential Centers (RRC) allow for semi-rural or suburban residential development on large lots; Highway Interchange Centers (HIC) are located along highways and provide for highway-oriented commercial uses; and Agricultural Services Centers (ASC) accommodate agricultural residential, convenience commercial, and agricultural industrial uses.

In southeastern Merced County north of the Madera County boundary, the land is designated for Agriculture along the valley floor and Foothill Pasture in the foothills on the west. The unincorporated communities of El Nido and Le Grande, located in southern Merced County, are designated as Specific Urban Development Plans (SUDP).

MARIPOSA COUNTY GENERAL PLAN

Mariposa County is located north of Madera County and shares a common boundary along the northeast part of the county, east of Merced County. The *Mariposa County General Plan* was adopted in 1981. The *Mariposa County General Plan* includes several overall guiding policies, which include the following:

- Establish site standards and adopting procedures that provide for clean, safe, sanitary, and economical building sites for the present and future residents of the county

- Set forth policies and programs that will encourage the development of basic transportation, sewage and water systems necessary and desirable for implementing the Mariposa County General Plan

- Plan development in a manner and style that will promote the availability of sufficient County revenues to provide cost-effective public services

- Provide a basis for coordinating land use and resource policy with federal agencies having land use management responsibilities in Mariposa County, as well as neighboring county and municipal jurisdictions

The *Mariposa County General Plan* identifies 11 established communities which are designated as Town Planning Areas. These Town Planning Areas provide basic services, are centers of commercial activity, and population concentration. Outside these Town Planning Areas, the General Plan designates land for rural uses.

The *Mariposa County General Plan* breaks the Land Use Diagram into 11 maps which cover the entire county with the exception of federally-owned lands. Adjacent to Madera County are the Green Mountain Planning Area and the Chowchilla River Region, which includes the community of Fish Camp.

Land in the Green Mountain area is designated for Exclusive Agriculture (AE), which establishes 160-acre parcel minimums. Land in the Chowchilla River Region is designated in several categories. The main designations are Mountain General (MG), which sets 40-acre parcel minimums, Mountain Home (MH), which establishes 5-acre minimum parcels and provides for residential uses, and Pubic Domain (PD), which sets no minimum parcel size, and General Forest (GF), with a 40-acre parcel minimum. The community of Fish Camp is a designated Town Planning Area, and provides for various residential and resort uses.

CITY OF FRESNO GENERAL PLAN

The City of Fresno is located immediately south of Madera County, south of the San Joaquin River. The City of Fresno is a large urbanized area, and northern Fresno has been the focus of rapid development over the last five years. The *City of Fresno General Plan* was adopted in 1984, and is scheduled for update in 1994. Relevant portions of the *General Plan* include the following:

- Promoting infill development in older portions of the city;
- Developing multiple activity centers to serve as the focal point for each of the city's major communities;
- Expanding public infrastructure in an efficient, fiscally-sound manner; and
- Limiting mid-rise development outside of the city's central area to the Route 41 corridor.

The City of Fresno adopted the *Woodward Park* and *Bullard Community Plans* which address land use and development in the northern part of Fresno.

Woodward Park Community Plan

The *Woodward Park Community Plan* was adopted in December 1989. The Woodward Park community is located on the east side of Route 41, south of the San Joaquin River and north of Herndon Avenue. Relevant policies in the *Woodward Park Community Plan* include the following:

- Development of an "activity center" to be located adjacent to the Route 41 interchange at Friant Road and Nees Avenue, intended to serve as the center of community activity and travel. This activity center is proposed to accommodate intensive residential, office, and commercial development, and to ultimately include a regional mall. Residential and less intensive commercial uses are planned to radiate out to the north and east from the activity center.

- Preservation and use of the San Joaquin riverbottom, supporting the *San Joaquin River Parkway Plan* and preservation of remaining riparian areas in the riverbottom by designating them for open space. Conservation of mineral resources in the riverbottom is encouraged by establishment of buffer zones between incompatible land uses and prohibition of development which would preclude mineral extraction within existing or potential surface mining areas. The plan prohibits development of new residential uses in the riverbottom to minimize flood risks.

- The plan directs traffic to Route 41 via the Friant Road and Herndon Avenue interchanges, to link with a proposed transit corridor adjacent and parallel to Route 4. Present and future transit efforts in the Woodward Park area are to be supported by such measures as pursuing land use patterns compatible with public transportation, creating a transit transfer station in the vicinity of Route 41 and Nees Avenue, and providing for the development of a mass transit system within the Route 41 corridor.

Bullard Community Plan

The *Bullard Community Plan* addresses land use in northwest Fresno, west of Route 41. Relevant policies and issues in the *Bullard Community Plan* include the following:

- The community plan establishes a mid-rise/high-rise corridor along Route 41 to accommodate commercial buildings over four stories in height. This corridor is designated to protect the integrity and future viability of Fresno's central area and to protect the city's public service delivery system, which has not been planned to accommodate high development intensities. High commercial densities along this corridor are intended to create a physical link between the central area and northern growth area, thus helping to revitalize downtown and to support future transit along Route 41. The northern border of the mid-rise/high-rise corridor is at the southern limit of the proposed project at Audubon Avenue, where the existing six-lane Route 41 freeway transitions to a two-lane highway.

- The community plan supports the *San Joaquin River Parkway Plan* and includes measures to enhance and preserve the riverbottom and bluffs, including maintenance of the multi-use/recreational open space plan designations in the riverbottom, establishment of a regional park site west of the Route 41 bridge, and development of the precise alignment of a San Joaquin Bluffs/River trail. The plan also calls for development of bluff vista points and extraction of sand and gravel resources.

CITY OF CLOVIS GENERAL PLAN

The City of Clovis is located in northeastern Fresno County, approximately seven miles southeast of Madera County. The City of Clovis adopted a revised General Plan in April 1993. The *Clovis General Plan* is based on an overall objective to establish a series of urban villages centered around multi-use activity centers and employment centers throughout the community. The Plan also focuses on downtown, with goals to revitalize its Old Town as the focal point of the community, supplemented by enhanced mixed use and commercial opportunities along downtown business corridors, with the strategic placement of transit centers long these corridors is intended to further strengthen downtown.

The *Clovis General Plan* may have implications for Madera County in two respects. First, the Plan provides for substantial population growth. Second, the Plan promotes a tiered transportation system which is contingent on the ultimate completion of a number of major transportation linkages, some of which could directly affect Madera County. The completion of Highway 168 to directly link to a proposed University of California campus (Academy site) and the Sierras is a fundamental assumption of the circulation system. The circulation system includes an inner and outer beltway. While the inner beltway is intended primarily

to provide internal circulation, the outer beltway is intended to serve through-traffic in a regional network. The outer beltway concept would link Clovis to State Highway 99 to the north and south. The concept of a northern connection would be to cross the San Joaquin River into Madera County, intersect with Route 41, and travel east to connect to Highway 99 south of Madera. In Fresno County, the beltway would intersect proposed Routes 168 and 180 and then travel north to connect to Highway 99 between Selma and Kingsburg.

The Plan also envisions two transit corridor alignments to increase Clovis' accessibility in the Fresno/Clovis Metropolitan area and to make Clovis more attractive to employment and regional commercial uses. These include proposed Highway 168 as the central transit corridor, linking traffic to the outer beltway. Right-of-way is to be reserved for multi-modal transit alternatives, including light rail. The second proposed transit corridor is along the old Southern Pacific railroad right-of-way, which follows the Clovis Avenue commercial corridor, intersects Old Town, and ultimately intersects the outer beltway. Several transit centers are proposed along these corridors.

CITY OF FIREBAUGH GENERAL PLAN

Firebaugh is a small city (population 5,100 in 1993) located in Fresno County, just west of Madera County's western boundary. The city's Planning Area includes two areas within Madera County: the Eastside Acres subdivision and the City's well farm.

Firebaugh has grown very slowly since 1980, averaging one to two percent annual population increases. From 1990 to 1991, however, the city grew by 13 percent. The City's General Plan projects population growth in the range of 6,350 to 7,210 by 2011. Firebaugh is predominantly an agricultural community, which relies on much of its services on the larger cities of Fresno and Madera. While moderate growth is likely to occur, the General Plan includes adequate holding capacity within Fresno County to accommodate such growth, and it is unlikely that significant demand for additional growth in Madera County will take place.

SIERRA NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN

The Sierra National Forest lies within Madera, Mariposa, and Fresno Counties. The *Sierra National Forest Land and Resource Management Plan* was adopted in 1991 and provides for the long-term management of forest lands.

The *Plan* provides for various uses and conservation of the forest land, including recreation, preserving visual resources, preserving wilderness areas, fishery resources, wildlife resources, sensitive plants, riparian areas, range management, timber harvesting, forest diversity, soils, water, minerals, hydroelectric development, and cultural resources.

The most important element of the *Plan* for Madera County was the reduction in the planned annual allowable sale quantity (ASQ) of timber in the forest to 88 MMBF (hundred million board feet) from over 125 MMBF. According to the *Plan*, this reduction will result in the closure of the timber mill in the Madera County community of North Fork.

REGIONAL TRANSPORTATION PLAN

The Madera County Transportation Commission (MCTC) is responsible for preparing a regional transportation plan to be updated every two years. In 1990, the MCTC developed a Regional Transportation Plan that addresses transportation issues and concerns that have emerged in the region as a result of rapid

growth, a deteriorating rural roadway system, and slow development of new transportation facilities. The Plan reviews issues related to aviation, goods movement, highways, transit, non-motorized transportation, and transportation systems management. The Plan is scheduled to be updated in 1994.

AIR QUALITY ATTAINMENT PLAN

The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) governs air quality controls and standards throughout the eight-county San Joaquin Valley Air Basin (SJVAB). The SJVUAPCD administers a set of rules and regulations that establishes permit requirements and procedures for activities involving air emissions. The APCD also administers its *Attainment Plan* for air quality. Since the SJVAB is a "nonattainment area" for ozone and fine particulate matter (PM10), preparation of the *Attainment Plan* was required to describe efforts to be taken in attaining and maintaining national ambient air quality standards. The *Plan*, which was adopted in 1992, contains numerous emissions control and reduction strategies.

Requirements for the *Attainment Plan* include the following:

- Provide for five percent per year reductions in nonattainment emissions
- Establish a permitting program that achieves no net increase in stationary source emissions
- Develop a strategy to reduce vehicle trips, use, and miles traveled
- Increase average vehicle ridership to 1.5 persons per vehicle during commute hours by 1999
- Reduce population exposure to pollutants by 25 percent by 1994
- Establish best available retrofit control technology requirements for all permitted sources
- Develop indirect and area source programs

As part of the last requirement to develop indirect and area source programs, the SJVUAPCD has developed guidelines for incorporation of an Air Quality Element or the equivalent into local General Plans to address the air quality implications of future development.

AIRPORT LAND USE COMPATIBILITY PLAN

The Madera County Airport Land Use Commission (ALUC) prepared the *Airport Land Use Compatibility Plan* for the two municipal airports in Madera County: Madera and Chowchilla. The *Plan* was adopted in November 1993.

The *Plan* reviews noise and safety considerations and establishes criteria for new development within designated airport zones Table 1-3 summarizes the degree of risk associated with each zone, as well as allowable densities and uses within each zone. Figures 1-5 and 1-6 shown the airport land use compatibility zones for the Madera and Chowchilla Airports, respectively. Provisions of the *Airport Land Use Compatibility Plan* are also discussed in Chapter 7, *Safety*, and Chapter 8, *Noise*.

FIGURE 1-5

MADERA MUNICIPAL AIRPORT COMPATIBILITY ZONES

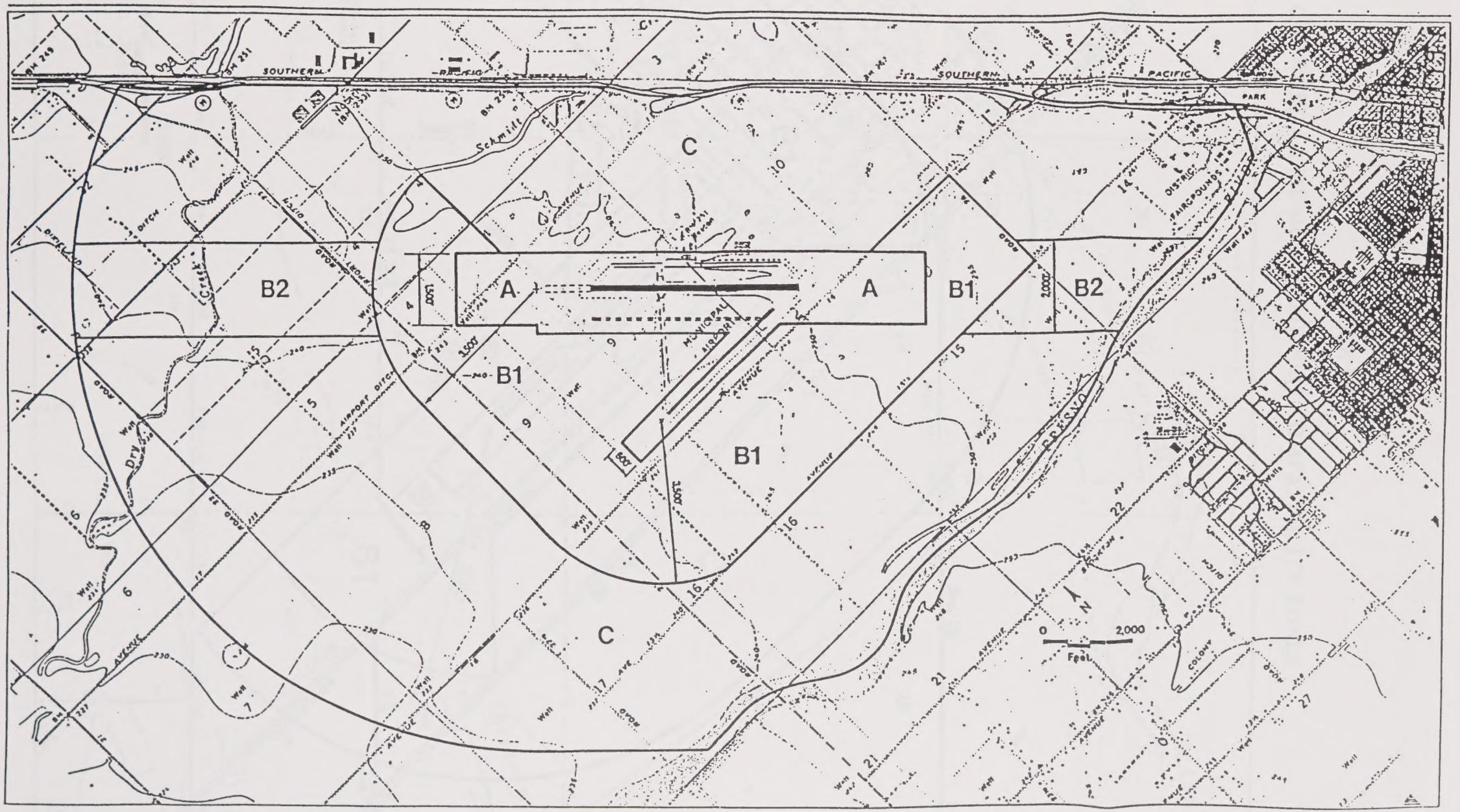


FIGURE 1-6

CHOWCHILLA MUNICIPAL AIRPORT COMPATIBILITY ZONES

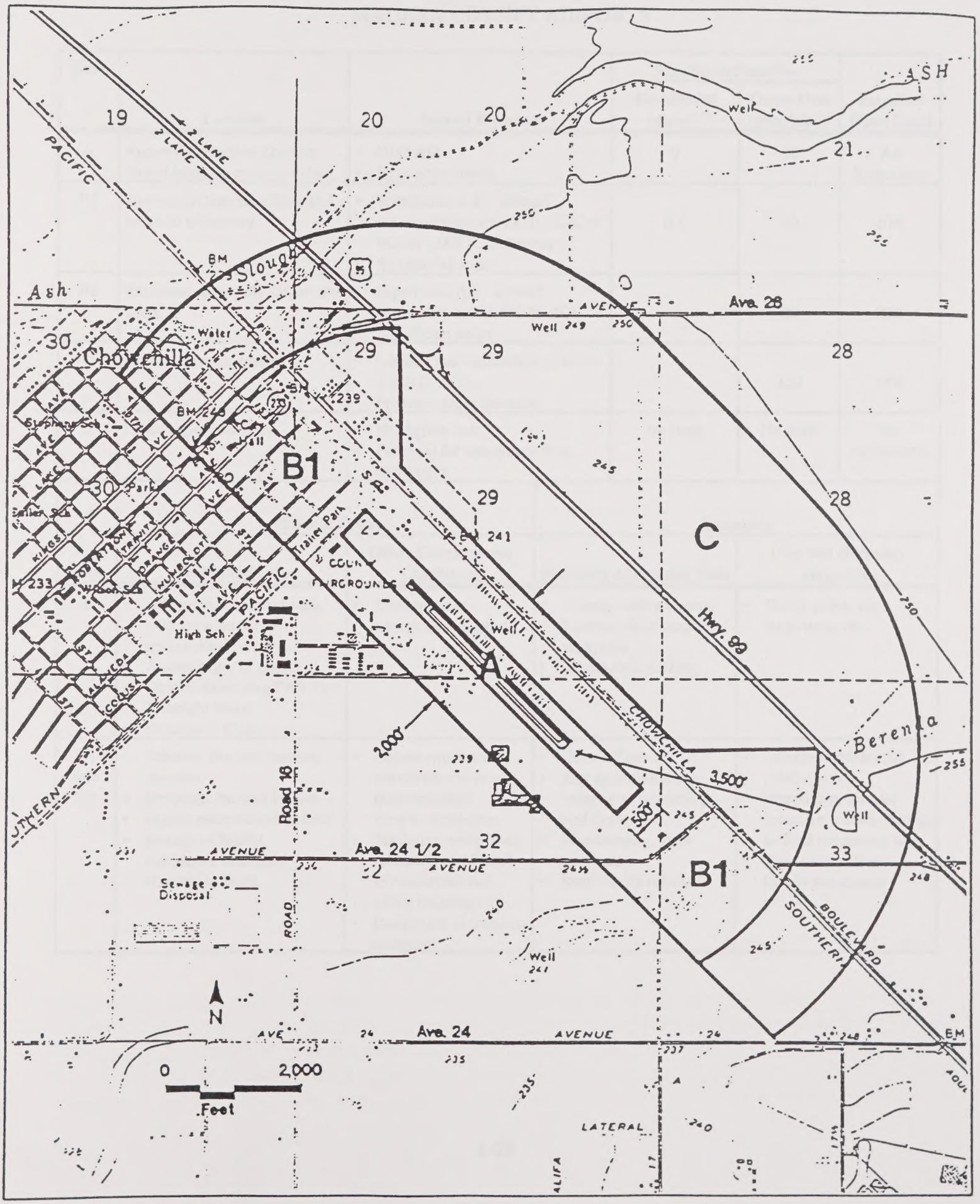


TABLE 1-3

AIRPORT ZONE COMPATIBILITY CRITERIA
MADERA COUNTY AIRPORTS

Zone	Location	Impact Elements	Maximum Densities		Required Open Land
			Residential (du/ac)[1]	Other Uses (people/ac)[2]	
A	Runway Protection Zone or within building restriction line	• High risk • High noise levels	0	10	All Remaining
B1	Approach/Departure Zone and adjacent to runway	• Substantial risk - aircraft commonly below 400 ft. AGL or within 1,000 ft. of runway • Substantial noise	0.1	60	30%
B2	Extended Approach/ Departure Zone	• Significant risk - aircraft commonly below 800 ft. AGL • Significant noise	3	60	30%
C	Common traffic pattern	• Limited risk - aircraft at or below 1,000 ft. AGL • Frequent noise intrusion	6	150	15%
D	Other airport environs	• Negligible risk • Potential for annoyance from overflights	No limit	No limit	No requirement

Zone	Additional Criteria		Examples	
	Prohibited Uses	Other Development Conditions	Normally Acceptable Uses	Uses Not Normally Acceptable
A	• All structures except ones with location set by aeronautical function • Assemblages of people • Objects exceeding FAR Part 77 height limits • Hazards to flight	• Dedication of navigation easement	• Aircraft tiedown apron • Pastures, field crops, vineyards • Automobile parking	• Heavy poles, signs, large trees, etc.
B1 and B2	• Schools, day care centers, libraries • Hospitals, nursing homes • Highly noise-sensitive uses • Storage of highly flammable materials • Hazards to flight	• Locate structures maximum distance from extended runway centerline • Minimum noise level reduction of 25 dBA in residential and office buildings • Dedication of aviation easement	• Uses in Zone A • Any agricultural use except ones attracting bird flocks • Warehousing, truck terminals • Single-story offices	• Suburban residential subdivisions • Intensive retail uses • Intensive manufacturing or food processing uses • Two-story offices • Hotels and motels

TABLE 1-3 (Continued)

AIRPORT ZONE COMPATIBILITY CRITERIA
MADERA COUNTY AIRPORTS

Zone	Additional Criteria		Examples	
	Prohibited Uses	Other Development Conditions	Normally Acceptable Uses	Uses Not Normally Acceptable
C	• Schools • Hospitals, nursing homes • Hazards to flight	• Dedication of overflight easement for residential uses	• Uses in Zone B • Parks, playgrounds • Low-intensity retail, offices, etc. • Low-intensity mfg., food processing • Two-story motels	• Shopping malls • Theaters, auditoriums • Sports stadiums • Office buildings with four or more stories
D	• Hazards to flight	• Deed notice required for residential development	• All except ones hazardous to flight	

Notes:
du = dwelling units
ac = acres
AGL = above ground level

Source: *Madera County Airport Land Use Compatibility Plan*, November 1993

INTEGRATED WASTE MANAGEMENT PLAN

The *Madera County Solid Waste Management Plan* was most recently revised in 1984. Upon passage of the California Solid Waste Integrated Waste Management Act of 1989 (AB 939) which substantially changed requirements for waste management planning, the County opted to prepare the newly-required components in conjunction with cities of Madera and Chowchilla. As a result, the County contracted with consultants to prepare a Source Reduction and Recycling Element and a Household Hazardous Waste Element. A of these segments of the plan was completed in 1992.

The Madera County *Source Reduction and Recycling Element* includes goals and policies to increase source reduction, recycling, and composting of the county's wastes.

A *Household Hazardous Waste Element* is also in form. The intent of this element is to develop a program for properly managing and disposing of household hazardous wastes.

HAZARDOUS WASTE MANAGEMENT PLAN

The *Madera County Hazardous Waste Management Plan* was completed and approved by the Madera County Board of Supervisors in January 1989. The goals of the plan reflect the County's intent to reduce the need for additional hazardous waste disposal sites by reducing the amount of waste generated. Goals related to waste reduction include minimizing waste at its source, recycling waste, and reducing the quantity of hazardous substances used. Goals related to public health and safety focus on properly treating waste that

cannot be reduced, ensuring safe transportation of waste on the key transportation routes, and enabling the siting of community collection and transfer stations to contribute to proper handling of the county's waste.

1.9 STATE AND FEDERAL AGENCIES CONCERNED WITH LAND USE

A wide range of State and Federal agencies exercise some level of regulatory control over land use decisions in Madera County, some through permitting or review authority and others through ownership of land.

AGENCIES WITH PERMITTING AUTHORITY

The State Lands Commission has exclusive jurisdiction over all submerged lands owned by the State as well as the beds of navigable rivers, sloughs, and lakes. The Commission has the authority to grant three kinds of permits: Mineral extraction leases, dredging permits (required for any dredging of navigable waterways for the improvement of navigation, reclamation, and flood control); and land use leases (required for any proposal to utilize navigable waterways for any purpose other than dredging, e.g., piers, floats, docks.).

The State Reclamation Board maintains jurisdiction over all Federal Flood Control Projects and levees that are either part of such projects or that may affect such projects. The Reclamation Board is authorized to grant Encroachment Permits for any activity proposed along or near flood control levees, including changes in land use, construction, earthwork, or removal of vegetation.

The State Department of Fish and Game (DFG) has jurisdiction over "all waters of the state,"as defined in the State *Resources Code* (Sections 1.56 and 1.72), including any lakes, streams, or rivers containing fish or wildlife resources. In Madera County, such waters include Millerton Lake, Hensley Lake, Eastman Lake, the San Joaquin River, the Fresno River, the Chowchilla River, and numerous streams and creeks The DFG has authority over two permitting processes: 1) streambed alteration agreements, required for projects that alter the flow of any lake, stream, or river in the state; and 2) suction dredging permits, required for projects involving suction or vacuum dredging activities in state waterways. Pursuant to *Fish and Game Code* Sections 1600 *et seq.*, DFG must be notified in advance of beginning projects that substantially divert, obstruct, or change the natural flow or the bed, bank, or channel of any stream or lake designated by DFG.

The State Regional Water Quality Control Board (RWQCB) maintains jurisdiction over discharges into all rivers, creeks, streams, and canals. Any project that will discharge wastes into any surface waters must conform to waste discharge requirements established by the RWQCB. These requirements serve as the Federal National Pollutant Discharge Elimination System (NPDES) permit. The RWQCB also works to obtain coordinated action in water quality control, including prevention and abatement of water pollution and nuisances.

The California Department of Transportation (Caltrans) has authority over all State highway and freeway rights-of-way, including easements, and undeveloped rights-of-way that have been acquired in anticipation of future construction. Any project that proposes to construct a road connection or perform earthwork within a state highway or freeway must obtain an encroachment permit from Caltrans.

Caltrans (District 6) is a major actor in highway facilities planning in Madera County. Current and planned projects include a Route Adoption Study for State Route 41 from Audobon Drive (at the end of the existing freeway in Fresno) north to Highway 145, a distance of approximately 12 miles. State (STIP) funds have been allocated for improvement of Highway 41 to a four-lane freeway from Friant Road (south of the river)

to Avenue 11, with construction to begin by 1997. Alignment studies are currently being prepared for the portion of the freeway north of Avenue 11 to Highway 145.

The United States Army Corps of Engineers, pursuant to the Rivers and Harbors Act, maintains jurisdiction over all navigable waterways (including non-navigable streams, creeks, marshes, and diked lands) and requires a permit for any work within these waterways. It also has permitting authority over filling of vernal pools and other wetlands under Section 404 of the federal Clean Water Act.

AGENCIES WITH REVIEW AUTHORITY

The following agencies, while they do not issue permits, maintain review authority and may comment on aspects of a development proposal that are related to their particular areas of expertise.

The State Department of Boating and Waterways comments on river-oriented features of a riverfront project such as potential for navigation hazards, relation to existing or planned boating facilities, and the public trust doctrine. This department also administers grants and loans for marina development and boat ramps, and reviews federal and local ordinances regulating boating activities.

The State Department of Parks and Recreation reviews development projects in relation to State recreation facilities, including Millerton Lake State Recreation Area. Within the Department of Parks and Recreation, the **State Office of Historic Preservation** is the designated State Historic Preservation Office (SHPO) and monitors State- and Federally-registered historic resources, as well as carrying out other statutory responsibilities.

The State of California Native American Heritage Commission reviews projects and comments on potential impacts to Native American archaeological resources. The Commission is directly involved with a procedure if Native American artifacts or remains are discovered during construction activities.

The State Department of Fish and Game, as a trustee agency, reviews projects and comments on potential impacts to fish and wildlife resources in general, and identifies potential impacts to endangered or threatened plant or animal species under the California Endangered Species Act. The Department is required to issue a written finding indicating whether a proposed project where the state is lead agency would "jeopardize" the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of habitat essential to the continued existence of the species. If the Department makes this "jeopardy" finding, it is then required to develop "reasonable and prudent alternatives" to conserve the endangered or threatened species.

The California State Clearinghouse, within the Office of Permit Assistance, is the point of contact for review of environmental documents where one or more State agencies will be a responsible or trustee agency. The Clearinghouse circulates environmental documents among State agencies, coordinates review, and forwards comments to the lead agency.

The State Mining and Geology Board reviews petitions (by an individual or organization) to classify specific lands that contain significant mineral deposits and that are threatened by land use incompatibilities. Mineral lands classified as having regional or statewide significance, in accordance with California's Surface Mining and Reclamation Act (SMARA), ultimately must be recognized in the County General Plan through adoption of appropriate and compatible land use designations and through establishment of policies and implementation programs for conservation and development of these resources.

The United States Environmental Protection Agency (EPA) has review authority over environmental documents that are prepared and circulated pursuant to the National Environmental Projection Act (NEPA). The EPA can comment on environmental impact statements (EISs), and NEPA procedures require filing of final EISs with the EPA. The EPA has authority over development projects pursuant to Section 404 of the Clean Water Act, an authority that overlaps with that of the Army Corps of Engineers. Generally, the EPA reviews Department of Army permits for compliance with guidelines for implementing Section 404 requirements. The EPA can, in rare cases, override an Army Corps of Engineers decision on a Department of Army permit in order to prohibit discharges into waterways.

The United States Fish and Wildlife Service must be consulted on all federal projects, such as the Army Corps of Engineers/Department of Army permits, pursuant to the Fish and Wildlife Coordination Act. The Service comments on potential project effects on "endangered or threatened" plant and animal species under the Federal Endangered Species Act. In reviewing a project, the Fish and Wildlife Service could issue a "jeopardy" determination and would propose reasonable alternatives to the permitting agency, in a process similar to the State Department of Fish and Game process. The Fish and Wildlife Service also comments generally on potential effects on fish and wildlife resources.

The National Marine Fisheries Service is also consulted on all Department of Army Permits as part of the Fish and Wildlife Coordination Act. The National Marine Fisheries Service reviews development projects in relation to overall effects on anadromous fish such as salmon, striped bass, and steelhead. The Service also considers any endangered or threatened anadromous fish which may exist in the area.

AGENCIES THAT OWN LAND

The U.S. Forest Service is a major landowner in Madera County. Its holdings include the Sierra National Forest, the Inyo National Forest, and the San Joaquin Experimental Range. The *Sierra National Forest's Land and Resource Management Plan* (1991) guides all Forest Service activities on these lands.

The U.S. Bureau of Land Management is also a major landowner in the county. Lands owned by BLM include various holdings, including land used for grazing and recreational purposes, including the Squaw Leap Recreation Area. BLM also manages the Millerton Lake State Recreation Area jointly with the California Department of Parks and Recreation.

The State of California (various agencies) is also a landowner in the county. State-owned lands include Millerton Lake State Recreation Area and the Central California Women's Facility (CCWF), located east of Fairmead. As of May 1994, the State Department of Corrections is constructing a second facility adjacent to the site, to double the population of the prison.

1.10 FINDINGS

- Madera County can be divided into three major geographic units: valley, foothills, and mountains. The western portion of the county is located in the San Joaquin Valley. Foothills form a transitional area between the valley floor on the west and the mountains on the east. The eastern third of the county is a mountainous area formed by the western slopes of the Sierra Nevada.

- The County is predominantly rural in character, with open space comprising roughly 90 percent of the total county area. The county's urban areas (Madera and Chowchilla) are located primarily in the valley, adjacent to prime agricultural lands and major transportation corridors (the Southern Pacific Railroad and State Highways 99).

- The County's General Plan includes several area plans: Oakhurst-Ahwahnee, Coarsegold, North Fork, O'Neals, Gunner Ranch West, and Rio Mesa. Drafts of two other area plans were undergoing public review as of October 1995: State Center Community College and an update of the Oakhurst-Ahwahnee Plan.

- The existing General Plan includes 25 land use designations, some of which apply only to land within one or two area plans.

- The Madera County Zoning Ordinance provides for a total of 40 zoning districts. Major zoning categories are Agricultural, Residential, Commercial, Industrial, Planned, Timber Preserve, and Open Space.

- The General Plans of the two incorporated cities in the county (Chowchilla and Madera) generally support preservation of agricultural land and measures (e.g., "infill" development, growth management techniques) to prevent urban sprawl. Both plans provide for substantial population growth over the next 20 years.

- Legislation that would allow the City of Chowchilla to annex the Central California Women's Prison east of Fairmead was introduced in the State Legislature during 1992 and could be reintroduced in the future.

- The *Highway 41 Corridor Study* included recommendations for substantial roadway improvements to address development within the rapidly growing foothill area.

- The City of Fresno's *Bullard Community Plan* provides for a mid-rise/high-rise corridor along Highway 41 south of Madera County, and promotes Highway 41 as a transit corridor.

- The *City of Clovis General Plan* envisions a regional beltway which would cross the San Joaquin River into Madera County, intersect Highway 41, and connect to State Highway 99 to the north and south.

- The most important element of the *Sierra National Forest Land Management Plan* for Madera County is the reduction in the planned annual allowable sale quantity (ASQ) of timber in the forest to 88 MMBF from over 125 MMBF. According to the Plan, this reduction will result in the closure of the timber mill in the Madera County community of North Fork.

- Other adopted County and regional plans include the Madera County Transportation Commission (MCTC) *Regional Transportation Plan*; the *San Joaquin Valley Unified Air Pollution Control District* (SJVUAPCD) *Attainment Plan*; *Airport Land Use Compatibility Plan*; and *Madera County Hazardous Waste Management Plan.*

- The U.S. Forest Service and State of California (various agencies) are major landowners in Madera County. Other State and Federal agencies exercise some form of permitting or review authority over land use decisions in the county.

1.11 PERSONS CONSULTED

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CHAPTER 2

POPULATION

CHAPTER 2

POPULATION AND EMPLOYMENT

2.1 INTRODUCTION

Information on the characteristics of the Madera County population and employment is essential to the process of updating the general plan. This chapter reviews historical population trends, demographics, and population projections for Madera County as reported by the *1990 U.S. Census of Population and Housing* and as estimated by the California Department of Finance. Population characteristics discussed include the size of the population and its distribution among the various cities and unincorporated areas; household size, the age structure of the population and where different age groups live; and the racial and ethnic characteristics of the population. Where appropriate, this information is compared to data from the 1980 census. The chapter summarizes population projections made by the California Department of Finance.

The chapter also reviews employment characteristics as reported by the Census, the California Employment Development Department, and the Madera County Economic Development Commission. Employment characteristics summarized include total employed persons residing in Madera County, the industries in which they work, and their occupations. Employment by Madera County industries is also summarized, along with a listing of the county's largest employers. A discussion of the county's jobs-housing balance concludes the employment section.

Detailed information on housing and household characteristics is contained in the Madera County *Housing Element,* adopted in September 1993.

2.2 HISTORIC POPULATION GROWTH

This section summarizes U.S. Census information and California Department of Finance (DOF) estimates on population and household size. It should be noted that while it is generally acknowledged that the 1990 Census undercounted certain population groups, especially the homeless and undocumented aliens, the federal government elected not to adjust the Census figures to account for the undercounting. Therefore, the numbers reported in this chapter may not reflect the entire Madera County population.

CENSUS INFORMATION

The U.S. Census collects comprehensive demographic information every ten years in the decennial census. Table 2-1 shows the total population, as reported by the Census, for Madera County for each decade from 1930 to 1990, and indicates both the ten-year increase and the average annual growth rate for each decade. Madera County's population more than quadrupled from 1930 to 1990.

As Table 2-1 shows, Madera County's population growth rate has varied greatly over the last 60 years. The highest rates of increase occurred during the decades from 1940 to 1950 (at 4.7 percent annual average growth rate) and from 1970 to 1980 (at 4.3 percent annual average growth rate). From 1980 to 1990, the county's growth rate averaged 3.4 percent annually. The county's slowest rate of growth occurred in the 1950s and 1960s, when the population increased by an average rate of less than one percent annually.

TABLE 2-1

MADERA COUNTY POPULATION
1930 to 1990

Year	Population	% Increase	Average Annual Increase*
1930	17,164	--	--
1940	23,314	35.8%	3.1%
1950	36,964	58.5%	4.7%
1960	40,468	9.5%	0.9%
1970	41,519	2.6%	0.2%
1980	63,116	52.0%	4.3%
1990	88,090	39.6%	3.4%

*Compounded annually, for the ten-year period

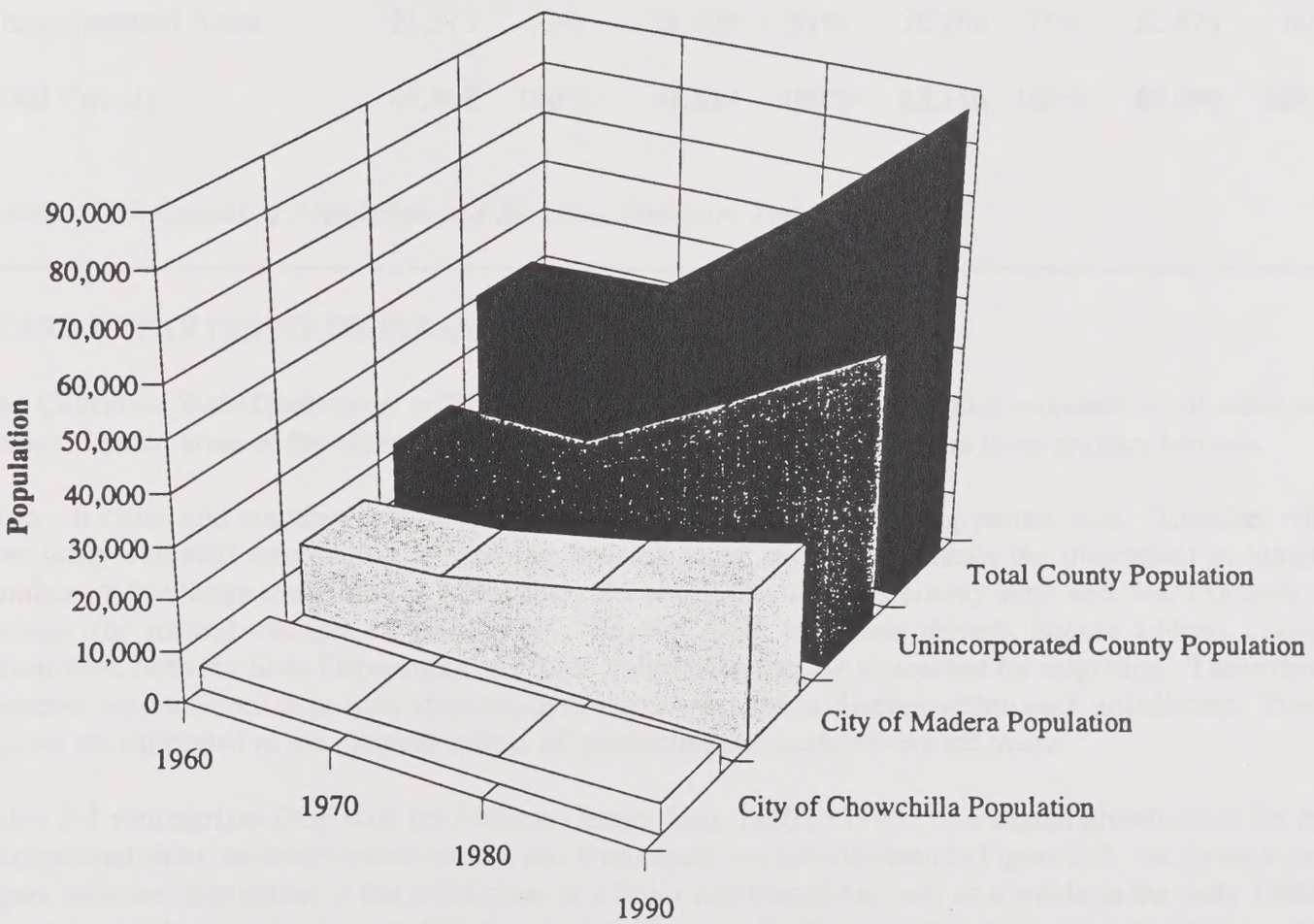
Source: U. S. Census Bureau, *Number of Inhabitants, California: 1980 Census,* 1980; U.S. Census of Population and Housing, *Summary Tape File 1*, 1990

According to the Census, the population of Madera County in 1990 was 88,090. Table 2-2 shows how the total population in 1990 was distributed among the cities of Madera County and the unincorporated areas, and how the distribution changed from 1960 to 1990. Figure 2-1 illustrates the U.S. Census information, for both the incorporated and unincorporated areas of Madera County.

As Table 2-2 shows, since 1970 the population has become increasingly concentrated in the unincorporated areas; while 49 percent of the population lived within the incorporated cities in 1970, that percentage decreased to 40 percent in 1990. From 1980 to 1990, the population in the unincorporated areas of the county grew by 46 percent, while the population in the cities increased by only 31 percent.

FIGURE 2-1

MADERA COUNTY POPULATION
1960 to 1990



Source: U.S. Bureau of the Census

TABLE 2-2

MADERA COUNTY POPULATION
1960 to 1990

	1960		1970		1980		1990	
	Pop	% of Total Pop	Pop	% of Total Pop	Pop	% of Total Pop	Pop	% of Total Pop
City of Madera	14,430	36%	16,044	39%	21,732	34%	29,281	33%
City of Chowchilla	4,525	11%	4,349	11%	5,122	8%	5,930	7%
Subtotal, Incorporated Areas	18,955	47%	20,393	49%	26,854	43%	35,211	40%
Unincorporated Areas	21,513	53%	21,126	51%	36,262	57%	52,879	60%
Total County	**40,468**	**100%**	**41,519**	**100%**	**63,116**	**100%**	**88,090**	**100%**

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

STATE DEPARTMENT OF FINANCE POPULATION ESTIMATES

The California State Department of Finance (DOF) prepares annual population estimates of all cities and unincorporated areas of the state. The base data for the estimates comes from three primary sources.

First, all cities and counties provide DOF with annual residential building permit data. Together with previously obtained information on existing housing units, such data indicate the theoretical maximum number of dwellings available for habitation. Second, DOF analyzes county birth and death records to account for natural changes in population. Finally, DOF examines driver's license address change information from the State Department of Motor Vehicles to attempt to account for migration. These three variables are combined to provide an estimate of annual population changes within each jurisdiction. These figures are calibrated to the national census of population that occurs every ten years.

Table 2-3 summarizes DOF data for Madera County from 1980 to 1993. The annual growth rates for the incorporated cities, unincorporated county, and total county are also depicted in Figure 2-2. As the table and figure indicate, population in the cities grew at a faster rate than the county as a whole in the early 1980s, primarily due to population growth in the city of Madera. Starting in 1984, however, population in the unincorporated area of the county began to outpace growth in the cities, with this trend accelerating through the early 1990s. From 1980 to 1990, population in the cities grew at an annual average rate of 3.0 percent, compared to population growth in the unincorporated areas that increased at an annual average rate of 3.8 percent. Population in both incorporated and unincorporated areas grew at an even higher rate in the early 1990s. From 1990 to 1993, population in the cities increased at an average annual rate of 4.0 percent, while the average annual population increase in unincorporated Madera County was 6.2 percent. During the last few years, Madera County has bee among the fastest growing counties in the state.

TABLE 2-3

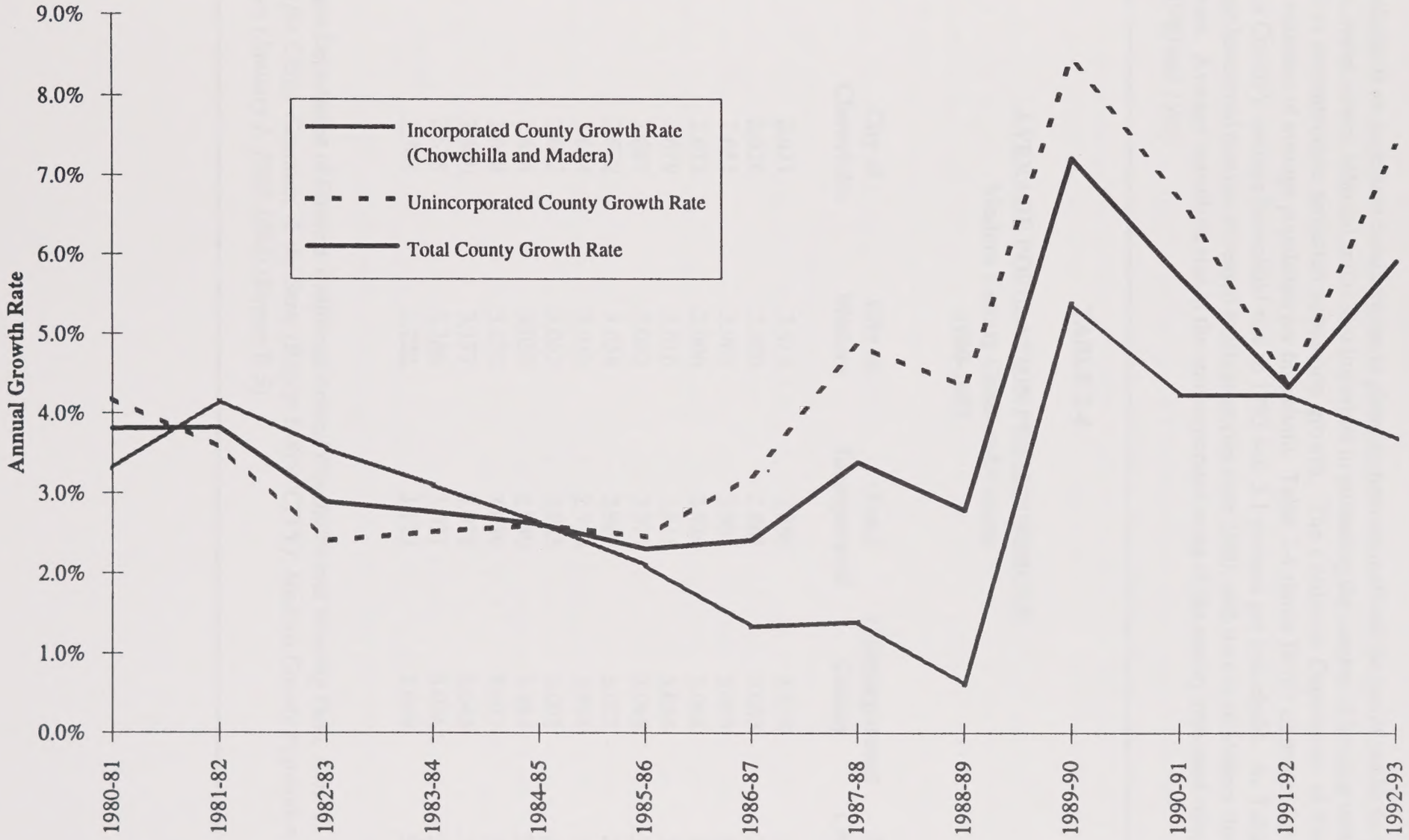
POPULATION ESTIMATES
Madera County Cities and County
1980-1993

Year	City of Chowchilla		City of Madera		Total Incorporated		Unincorporated		Total County	
	No.	%	No.	%	No.	%	No.	%	No.	%
1980	5,122	--	21,732	--	26,854	--	36,262	--	63,116	--
1981	5,130	0.2%	22,612	4.0%	27,742	3.3%	37,774	4.2%	65,516	3.8%
1982	5,190	1.2%	23,704	4.8%	28,894	4.2%	39,123	3.6%	68,017	3.8%
1983	5,242	1.0%	24,678	4.1%	29,920	3.6%	40,064	2.4%	69,984	2.9%
1984	5,638	7.6%	25,210	2.2%	30,848	3.1%	41,073	2.5%	71,921	2.8%
1985	5,718	1.4%	25,941	2.9%	31,659	2.6%	42,143	2.6%	73,802	2.6%
1986	5,766	0.8%	26,558	2.4%	32,324	2.1%	43,178	2.5%	75,502	2.3%
1987	5,771	0.1%	26,985	1.6%	32,756	1.3%	44,570	3.2%	77,326	2.4%
1988	5,723	-0.8%	27,490	1.9%	33,213	1.4%	46,734	4.9%	79,947	3.4%
1989	5,733	0.2%	27,682	0.7%	33,415	0.6%	48,762	4.3%	82,177	2.8%
1990	5,930	3.4%	29,281	5.8%	35,211	5.4%	52,879	8.4%	88,090	7.2%
1991	6,394	7.8%	30,305	3.5%	36,699	4.2%	56,428	6.7%	93,127	5.7%
1992	6,510	1.8%	31,740	4.7%	38,250	4.2%	58,905	4.4%	97,155	4.3%
1993	6,631	1.9%	33,027	4.1%	39,658	3.7%	63,236	7.4%	102,894	5.9%
Average Annual Growth Rate (Compounded)										
1980-1993		2.0%		3.3%		3.0%		4.4%		3.8%
1980-1990		1.5%		3.0%		2.7%		3.8%		3.4%
1990-1993		3.8%		4.1%		4.0%		6.2%		5.4%

Source: California Department of Finance, *California Annual Population and Housing Data, April 1, 1980 to April 1, 1990 for Cities, Counties, & the State* (Report E-8090CITY); *Madera County Population and Housing Estimates (January 1, 1991-1993)* (Report E-5)

FIGURE 2-2

ANNUAL POPULATION GROWTH RATE
Madera County
1980 to 1993



Source: California Department of Finance, Madera County Population and Housing Estimates, 1980-1993

HOUSEHOLD SIZE

The size of households is an important consideration in planning because it affects the use of public facilities and services (e.g., water, sewer, schools) and is also important in estimating the number of housing units that will be required to accommodate projected population growth. The California Department of Finance provides annual estimates of average population per household. Table 2-4 shows DOF's estimates for 1980 to 1993. Madera County's average household size in 1993 was 3.1 persons per household. As Table 2-4 shows, the average household size has increased in all categories since 1980, with the city of Madera showing the greatest increase. Average household size in the unincorporated areas of the county remained relatively stable between 1980 and 1993.

TABLE 2-4

AVERAGE POPULATION PER HOUSEHOLD
Madera County Cities and County
1980-1993

Year	City of Chowchilla	City of Madera	Total Incorporated	Unincorporated County	Total County
1980	2.631	2.913	2.855	3.078	2.979
1981	2.626	2.920	2.861	3.053	2.969
1982	2.651	2.965	2.903	3.063	2.993
1983	2.673	2.996	2.934	3.066	3.008
1984	2.679	3.016	2.948	3.054	3.008
1985	2.687	3.042	2.971	3.045	3.013
1986	2.672	3.038	2.966	3.015	2.994
1987	2.654	3.032	2.958	2.994	2.978
1988	2.663	3.062	2.985	3.002	2.994
1989	2.648	3.059	2.980	2.984	2.982
1990	2.668	3.152	3.059	3.037	3.046
1991	2.680	3.177	3.078	3.045	3.058
1992	2.678	3.166	3.071	3.036	3.050
1993	2.708	3.222	3.123	3.099	3.108

Source: California Department of Finance, *California Annual Population and Housing Data, April 1, 1980 to April 1, 1990 for Cities, Counties, & the State* (Report E-8090CITY); *Madera County Population and Housing Estimates (January 1, 1991-1993)* (Report E-5)

2.3 POPULATION CHARACTERISTICS

This section summarizes 1990 Census information on age, gender, and ethnicity for Madera County, its cities, and unincorporated communities.

AGE

The following three tables show the age characteristics of the county population. Table 2-5 shows the distribution of the population among four age groups and between the incorporated cities and the unincorporated portion of the county. Table 2-5 shows the distribution of children (less than 18 years old) within the county. Table 2-7 shows the distribution of elderly residents (greater than 65 years of age) within the county. Tables 2-6 and 2-7 show the data for the cities and for the Census designated places (CDPs) in the unincorporated areas. A Census designated place is an area with a population of more than 1,000 persons.

The age distribution in Madera County reflected in the 1990 census is not substantially different from the age distribution reflected in the 1980 Census, when 9 percent of the county population was in the 0-4 age group, 23 percent in the 5-17 group, 57 percent in the 18-64 group, and 11 percent in the 65 and older category.

TABLE 2-5

AGE DISTRIBUTION
Madera County
1990

	Incorporated Cities		Unincorporated Areas		Madera County Total	
Age Group	**No.**	**%**	**No.**	**%**	**No.**	**%**
0 to 4 Years	3,450	9.8%	3,875	7.3%	7,325	8.3%
5 to 17 Years	8,179	23.2%	11,879	22.5%	20,058	22.8%
18 to 64 Years	19,157	54.4%	30,774	58.2%	49,931	56.7%
65 Years and Older	4,425	12.6%	6,351	12.0%	10,776	12.2%
Total Population	**35,211**	**100%**	**52,879**	**100%**	**88,090**	**100%**

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

Tables 2-6 and 2-7 show the distribution of children and elderly by place. The highest proportions of children in 1990 were found in the unincorporated communities of Parksdale, Bonadelle Ranchos-Madera Ranchos, Yosemite Lakes, and in the city of Madera, while Oakhurst and Chowchilla had lower percentages than the rest of the county. The highest proportion of elderly in 1990 was in the unincorporated community of Oakhurst, followed by the city of Chowchilla.

TABLE 2-6

DISTRIBUTION OF CHILDREN
Madera County
1990

	Children	Total Population	Percent Children
Incorporated Cities			
Chowchilla	1,710	5,930	28.8%
Madera	9,919	29,281	33.9%
Subtotal, Incorporated Cities	**11,629**	**35,211**	**33.0%**
Unincorporated County			
Bonadelle Ranchos-Madera Ranchos CDP	1,969	5,705	34.5%
Madera Acres CDP	1,975	5,245	37.7%
Oakhurst CDP	569	2,602	21.9%
Parksdale CDP	685	1,911	35.8%
Parkwood CDP	551	1,659	33.2%
Yosemite Lakes CDP	604	2,367	34.3%
Remaining Unincorporated County	9,401	33,390	28.2%
Subtotal, Incorporated County	**15,745**	**52,879**	**29.8%**
Total	**27,383**	**88,090**	**31.1%**

CDP = Census designated place

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

TABLE 2-7

DISTRIBUTION OF ELDERLY PEOPLE
(65 and Over)
Madera County
1990

	Number of Elderly	Total Population	Percent Elderly
Incorporated Cities			
Chowchilla	1,040	5,930	17.5%
Madera	3,385	29,281	11.6%
Subtotal, Incorporated Cities	**4,425**	**35,211**	**12.6%**
Unincorporated County			
Bonadelle Ranchos-Madera Ranchos CDP	290	5,705	5.1%
Madera Acres CDP	225	5,245	4.3%
Oakhurst CDP	701	2,602	26.9%
Parksdale CDP	177	1,911	9.3%
Parkwood CDP	130	1,659	7.8%
Yosemite Lakes CDP	336	2,367	14.2%
Remaining Unincorporated County	4,672	33,390	14.0%
Subtotal, Incorporated County	**6,531**	**52,879**	**12.4%**
Total	**10,776**	**88,090**	**12.2%**

CDP = Census designated place

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

GENDER

The percentages of men and women in Madera County in 1990 (50.2 percent male and 49.8 percent female) were virtually identical to the 1980 Census (50.3 percent male and 49.7 percent female). According to the 1990 Census, there were more women than men in the two incorporated cities and in Oakhurst; however, there were more men than women residing in the remaining unincorporated parts of the county. Table 2-8 shows the distribution of men and women within the county.

TABLE 2-8

POPULATION DISTRIBUTION BY SEX
Madera County
1990

	MALE		FEMALE	
	No.	**%**	**No.**	**%**
Incorporated Cities				
Chowchilla	2,838	47.9%	3,092	52.1%
Madera	14,221	48.6%	15,060	51.4%
Subtotal, Incorporated Cities	**17,059**	**48.4%**	**18,152**	**51.6%**
Unincorporated County				
Bonadelle Ranchos-Madera Ranchos CDP	2,904	50.9%	2,801	49.1%
Madera Acres CDP	2,664	50.8%	2,581	49.2%
Oakhurst CDP	1,195	45.9%	1,407	54.1%
Parksdale CDP	1,000	52.3%	911	47.7%
Parkwood CDP	830	50.0%	829	50.0%
Yosemite Lakes CDP	1,191	50.3%	1,176	49.7%
Remaining Unincorporated County	17,368	52.0%	16,022	48.0%
Subtotal, Incorporated County	**27,152**	**51.3%**	**25,727**	**48.7%**
Total	**44,211**	**50.2%**	**43,879**	**49.8%**

CDP = Census designated place

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

ETHNICITY

The population of Madera County is predominantly white, comprising over two-thirds of the population. The proportion of whites is lower in the cities at 62.6 percent and higher in the unincorporated areas at 78.1 percent. Blacks, American Indians, and Asians constitute only small fractions of the total county population. Table 2-9 shows the ethnicity of Madera County residents as reported by the Census. It should be noted that the Census distinguishes between ethnicity (or race) and place of origin. Persons of Hispanic origin are counted under various ethnic groups; racially, most Hispanics are white. Table 2-10 describes the distribution of Hispanics in Madera County.

TABLE 2-9

ETHNICITY
Madera County
1990

Ethnic Group	Incorporated Cities No.	%	Unincorporated Areas No.	%	Madera County Total No.	%
White	22,059	62.6%	41,310	78.1%	63,369	71.9%
Black	1,398	0.4%	1,096	2.1%	2,494	2.8%
American Indian, Eskimo, or Aleut	379	1.1%	1,039	2.0%	1,418	1.6%
Asian or Pacific Islander	535	1.5%	729	1.4%	1,264	1.4%
Other*	10,840	30.8%	8,705	16.5%	19,545	22.2%
Total Population	**35,211**	**100%**	**52,879**	**100%**	**88,090**	**100%**

Note: Sum of percentages may not equal 100 because of rounding.

*Other includes predominantly persons of Hispanic origin. The Census distinguishes between ethnicity (or race) and place of origin. The Census defines Hispanic origin as persons from Mexico, Spain, and other Latin American countries. Racially, most Hispanics are white.

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

Over one-third of the county is Hispanic. The city of Madera and the unincorporated communities of Parksdale and Parkwood have higher proportions of Hispanics than the countywide average. Chowchilla, Oakhurst, and the Yosemite Lakes areas have much lower than average percentages of Hispanics. Table 2-10 shows the distribution of Hispanic residents in Madera County.

TABLE 2-10

DISTRIBUTION OF HISPANIC POPULATION
Madera County
1990

Location	Hispanic Population	Total Population	Percent Hispanic
Incorporated Cities			
Chowchilla	840	5,930	14.2%
Madera	15,759	29,281	53.8%
Subtotal, Incorporated Cities	**16,599**	**35,211**	**47.1%**
Unincorporated County			
Bonadelle Ranchos-Madera Ranchos CDP	870	5,705	15.2%
Madera Acres CDP	1,676	5,245	32.0%
Oakhurst CDP	109	2,602	4.2%
Parksdale CDP	1,241	1,911	64.9%
Parkwood CDP	645	1,659	38.9%
Yosemite Lakes CDP	98	2,367	4.1%
Remaining Unincorporated County	9,162	33,390	14.0%
Subtotal, Incorporated County	**13,801**	**52,879**	**26.1%**
Total	**30,400**	**88,090**	**34.5%**

CDP = Census designated place

Source: *U.S. Census of Population and Housing, Summary Tape File 1*, 1990.

2.4 POPULATION PROJECTIONS

This section documents and evaluates population projections that have been made for Madera County by the State Department of Finance (DOF). The Population Research Unit of the California State Department of Finance (DOF) prepares projections of the future population of each of California's 58 counties. DOF uses a baseline cohort method to project future population by age and sex. This method separates the total population into smaller categories based on age and sex. Once a baseline count is established, it is possible to "age" the population into the future on the basis of three important assumptions.

First, the survival rate estimates the percentage of each age group that is expected to survive each year. Second, the fertility rate is applied to women of child-bearing age to estimate the number of children born each year. Finally, migration rates are used to estimate the number of new people that will move into each county each year. Each of these factors is derived for each county within California based upon examination of past trends. In addition, the DOF model assumes no major social distortions such as war or economic

depression, no major natural catastrophes such as famine or disease, and that people have the right to migrate where and when they choose. Special populations (such as prisons) are added to the total.

DOF published its most recent population projections in April 1993, which included countywide populations by race and ethnicity by decade to 2040, as shown in Table 2-11 and Figure 2-3. DOF projects that Madera County's population will reach 317,900 in 2040.

Between 1990 and 2010, DOF projects that Madera County's population will increase by 82,000 people between 1990 and 2010, for a total 2010 population of 171,800. These projections replaced two earlier published DOF projections. DOF's *Household Projections for California Counties to 2020*, published in February 1989, projected a Madera County population of 139,100 in 2010. DOF's *Interim Population Projections for California State and Counties 1990-2005*, published in April 1991, projected Madera County population at 134,800 in 2005. The April 1993 figures project substantially higher population growth in Madera County than the previous projections. Significantly, DOF's earlier projections were used as the basis for some regional planning efforts, including as the basis for planning for the San Joaquin Unified Air Pollution Control District's *Air Quality Attainment Plan.*

Table 2-11 and Figure 2-3 show the results of DOF projections for Madera County by race and ethnicity. It should be noted that unlike the Census, DOF separates persons of Hispanic origin from other racial categories.

TABLE 2-11

DOF POPULATION PROJECTIONS BY RACE AND ETHNICITY
Madera County
1990-2040

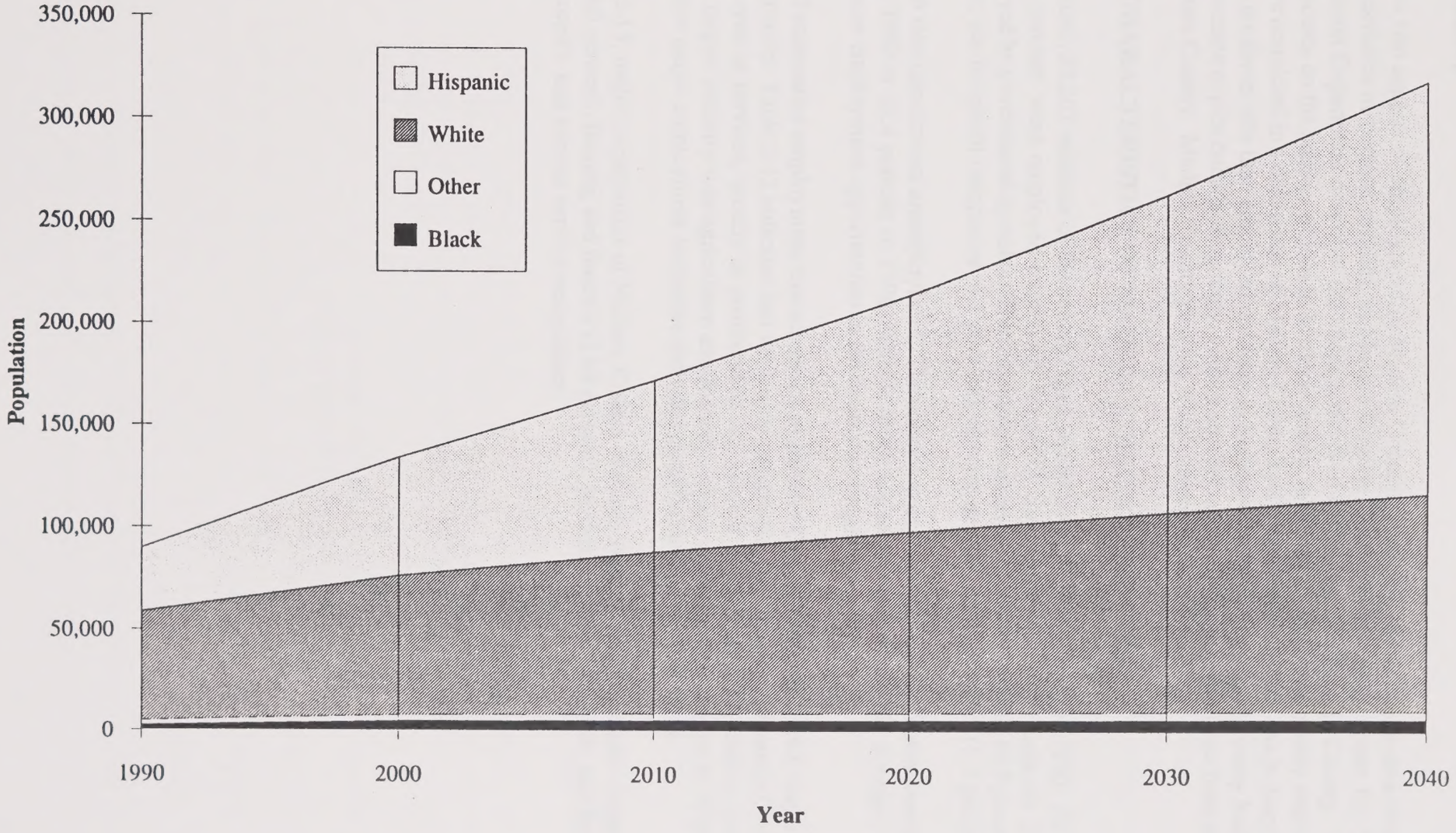
	1990	2000	2010	2020	2030	2040
White	54,100	69,100	79,800	89,300	98,100	106,500
Black	2,400	4,700	5,100	5,500	6,000	6,500
Hispanic	31,000	57,300	83,600	115,800	155,000	200,900
Other	2,300	2,900	3,300	3,500	3,800	4,000
Total	**89,800**	**134,000**	**171,800**	**214,100**	**262,900**	**317,900**
Percent Increase from 1990		49.2%	91.3%	138.4%	192.8%	254.0%

Source: California Department of Finance, *Population Projections by Race/Ethnicity for California and its Counties 1990-2040*, (Report 93 P-1), April 1993

The General Plan relies on slightly higher rate of population growth as the result of designating new growth areas in southern Madera County that were not assumed in DOF's projections. The General Plan projects total county population of 177,071 in 2010, for an annual average compound growth rate of 3.55 percent.

FIGURE 2-3

POPULATION PROJECTIONS FOR MADERA COUNTY
BY RACE/ETHNICITY
1990 to 2040



Source: California Department of Finance, Population Projections by Race/Ethnicity for California and its Counties 1990-2040 (Report 93 P-1), April 1993

2.5 EMPLOYMENT

This section reviews two aspects of employment in Madera County. First, the 1990 Census data reviews employment characteristics of persons residing in Madera County. Second, information from the State Economic Development Department describes the characteristics of employment in Madera County. This second discussion focuses on the number of jobs in Madera County, including those of non-county residents. Finally, these two are correlated in a discussion of Madera County's jobs to housing balance. As is described in this section, there are fewer jobs than employed residents in Madera County, indicating that many Madera County residents commute to jobs outside the county, while a smaller number of person commute from other areas to jobs in Madera County. Madera County also has a high unemployment rate.

EMPLOYMENT CHARACTERISTICS OF MADERA COUNTY RESIDENTS

According to the Census, 33,263 residents of the county (aged 16 and over) were employed in 1990. Of this total, 22,439 (67.5 percent) were employed by private, for-profit companies and 5,446 residents (16.2 percent) were employed by government agencies. The remaining workers were self-employed (10.9 percent), employed by private, not-for-profit companies (4.1 percent), or were unpaid family workers (1.2 percent).

These statistics do not take into account unemployment. The unemployment rate in Madera County increased from 8.6 percent in 1980 to 12.4 percent in 1990. This is much higher than the statewide average, and reflects a need for more employment opportunities in the county and region.

Tables 2-12 and 2-13 summarize employment characteristics of Madera County residents in two ways: by industry and by occupation. Table 2-12 indicates that the largest percentage (28 percent) of Madera County workers were employed in services, mostly in professional and related services (e.g., education, health services). The next largest industry was agriculture and forestry, which employed 16 percent of Madera County workers. Other major employment industries included manufacturing and retail trade.

As shown in Table 2-13, major occupations of Madera County workers included administrative support, including clerical (14.6 percent); farming and forestry (13.8 percent); precision production, craft, and repair occupations (11.8 percent); and various service occupations.

TABLE 2-12

EMPLOYMENT OF MADERA COUNTY RESIDENTS BY INDUSTRY
1990

Industry	Number	Percent
Agriculture & Forestry	5,444	16.4%
Mining 130		0.4%
Construction	2,486	7.5%
Manufacturing:		
Nondurable Goods	1,658	5.0%
Durable Goods	2,611	7.8%
Subtotal	4,269	12.8%
Transportation	1,249	3..8%
Communications & Other Public Utilities	935	2.8%
Wholesale Trade	1,329	4.0%
Retail Trade	4,959	14.9%
Finance, Insurance, & Real Estate	1,442	4.3%
Services:		
Business & Repair Services	1,454	4.4%
Personal Services	977	2.9%
Entertainment & Recreation	434	1.3%
Professional & Related Services:		
Health Services	2,153	6.5%
Educational Services	2,808	8.4%
Other Professional & Related Services	1,635	4.9%
Subtotal, Professional & Related Services	6,596	19.8%
Subtotal, Services	9,461	28.4%
Public Administration	1,559	4.7%
Total	**33,263**	**100.0%**

Source: U.S. Census Bureau, *Summary Tape File 3, Madera County, 1990*

TABLE 2-13

EMPLOYMENT OF MADERA COUNTY RESIDENTS BY OCCUPATION
1990

Occupation	Number	Percent
Managerial & Professional Specialty Occupations:		
Executive, Administrative, & Managerial	2,771	8.3%
Professional Specialty	3,219	9.7%
Subtotal, Managerial & Professional Specialty	5,990	18.0%
Technical, Sales, & Administrative Support:		
Technicians & Related Support	927	2.8%
Sales	3,453	10.4%
Administrative Support, Including Clerical	4,870	14.6%
Subtotal, Technical, Sales, & Administrative Support	9,250	27.8%
Service Occupations:		
Private Household	188	0.6%
Protective Service	555	1.7%
Service, Except Protective and Household	3,132	9.4%
Subtotal, Service Occupations	3,875	11.6%
Farming & Forestry Occupations	4,597	13.8%
Precision Production, Craft, & Repair Occupations	3,940	11.8%
Operators, Fabricators, and Laborers:		
Machine Operators, Assemblers, & Inspectors	1,890	5.7%
Transportation & Material Moving Occupations	2,081	6.3%
Handlers, Equipment Cleaners, Helpers, & Laborers	1,640	4.9%
Subtotal, Operators, Fabricators, and Laborers	5,611	16.9%
Total	**33,263**	**100.0%**

Source: U.S. Census Bureau, *Summary Tape File 3, Madera County, 1990*

CHARACTERISTICS OF MADERA COUNTY JOBS

Table 2-14 shows the number of jobs in Madera County in 1980, 1990, and 1992, as reported by the California Employment Development Department (EDD), which uses slightly different classifications than the U.S. Census. These figures account for persons residing in other counties who commute to jobs in Madera County as well as persons who both live and work in the county.

Table 2-14 indicates that from 1980 to 1990, services industries were the fastest growing employers in Madera County, increasing by over 51 percent, followed by construction and mining (47.5 percent), retail trade (44.1 percent), and government (42.3 percent). Both industries that showed declines from 1980 to 1990, transportation/public utilities and wholesale trade, showed significant increases from 1990 to 1992.

Madera County's agricultural employment fluctuates on a seasonal basis. In 1992, during September (the peak harvest month), 16,950 persons were employed in agriculture. The seasonal low, recorded in March 1992, was 5,550 persons employed in agriculture.

TABLE 2-14

MADERA COUNTY EMPLOYMENT
By Category
1980, 1990, 1992

Category	1980	1990	% Change 1980-90	1992	% Change 1990-92
Agricultural Employment	6,475	7,275	12.4%	8,025	10.3%
Non-Agricultural Employment					
Construction and Mining	1,000	1,475	47.5%	1,050	-28.8%
Manufacturing	3,275	3,825	16.8%	3,975	2.6%
Transportation and Public Utilities	775	700	-10.7%	875	25.0%
Wholesale Trade	675	725	-7.4%	850	17.2%
Retail Trade	2,775	4,000	44.1%	4,475	11.9%
Finance, Insurance, Real Estate	525	550	4.8%	500	-10.0%
Services	2,375	3,600	51.6%	4,150	15.3%
Government	3,725	5,300	42.3%	5,350	0.9%
Subtotal, Non-agricultural	15,125	20,175	33.4%	21,200	5.1%
Total Wage and Salary Employment	**21,600**	**27,450**	**26.2%**	**29,225**	**6.5%**

Sources: Madera County Economic Development Commission, *Industrial Sites Directory*; California Economic Development Department

Tables 2-15 and 2-16 list the county's largest manufacturing and non-manufacturing companies in 1990. Many of the largest employers were government agencies, including the Madera Unified School District, Madera County, the State of California, and the National Park Service. Other large employers included

Gottschalks, Heublein Wines, Oberti Olives, Regency Thermographers, Sierra On Line, and Madera Community Hospital.

TABLE 2-15

MAJOR MANUFACTURING EMPLOYMENT
Madera County
1990

Company	Product	No. of Employees
Heublein Wines, Inc.	Wine	500
Oberti Olives	Olives, Olive Products	250-500
Regency Thermographers	Printing	450
Madera Glass Company	Wine Bottles	350
FMC Corporation	Food Processing Machinery	300
Certainteed Corp.	Fiberglass Insulation	300
Baltimore Aircoil	Evaporative Condensers	150-250
Valley Grain Products	Bulk Corn, Masa Flour	180
Sequoia Forest Products	Lumber	141

Source: Madera County Economic Development Commission, *Industrial Sites Directory*

TABLE 2-16

MAJOR NON-MANUFACTURING EMPLOYMENT
Madera County
1990

Company	Type of Business	No. of Employees
Madera Unified School District	Education	1,225
Madera County	Government	950
Gottschalks	Distribution	320-550
National Park Service	Government	150-400
Madera Community Hospital	Health Care	400
Sierra On Line	Computer Software	400
Chowchilla School District	Education	230
City of Madera	Government	200
State of California	Government	790
Saulsberry Almond Processing	Almonds	165

Source: Madera County Economic Development Commission, *Industrial Sites Directory*

JOBS-HOUSING RATIO

During the last decade, increasing traffic congestion, housing costs, and the fiscal impacts on local governments have raised the issue of the relationship of jobs to housing, or of jobs and workers in a community. While commonly referred to as "jobs-housing balance," the analysis actually focuses on the ratio of jobs to workers in a community. The term "jobs-housing" is misleading because it implies an ideal ratio of one job for each housing unit. Since it is common to find more than one worker per household in some areas where both husband and wife work, and less than one worker per household in retirement areas, a better analysis focuses on the number of jobs to employed residents. According to the 1990 Census, countywide, Madera had an average of 1.18 workers per household. Within the city of Madera, that ratio was 1.11, while in Chowchilla, the ratio was 0.90.

In an ideal situation, there would be one job for every employed resident. This "balance" between jobs in a community and workers in the community to fill those jobs would, in theory, allow residents the opportunity to work in their community, thereby reducing long-distance commuting. A further measure of jobs -housing balance would examine the types and wages of jobs available in a community versus the skills of workers and housing costs.

The data summarized in Table 2-17 indicates that Madera County had more workers than jobs in 1980, 1990, and 1992. As a result, in 1992, for example, at least 8,000 residents were commuting to jobs outside the county, most to jobs in Fresno County. This number is probably much higher, since many people who work in Madera County commute in from other areas, primarily Fresno County.

TABLE 2-17

JOBS AND EMPLOYED RESIDENTS
Madera County
1980, 1990, 1992

Year	Employed Residents	Jobs
1980	27,225	21,600
1990	33,525	27,450
1992	37,330	29,225

Source: Madera County Economic Development Commission, *Industrial Sites Directory*; California Economic Development Department

An review of vacant sites currently designated for employment and housing uses indicates an ample supply of both in Madera County. According to the Madera County Economic Development Commission's *Industrial Sites Directory*, in 1990 there were nearly 2,500 acres of vacant industrially-designated land in the county. Approximately 185 acres were located within the Chowchilla city limits, 390 acres within the Madera city limits, and 1,900 acres in the unincorporated county. Much of this land was located in the Berenda industrial area. There is also substantial vacant residential land throughout the county. This

indicates that, in Madera County, the imbalance between local jobs and employed residents is not the result of an inadequate supply of non-residentially zoned land. It instead indicates that market forces have directed commercial and industrial development elsewhere in the region.

As a practical matter, even if there were a perfect jobs-housing balance in the county, there could still be substantial commuting into and out of the county. People choose places of residence for a variety of reasons, only one of which is proximity to work. They may choose to commute to other areas away from where their residence for reasons of salary, skills required, or working conditions.

2.6 FINDINGS

- Madera County's population more than doubled from 1970 to 1990, for a population of 88,079 in 1990.
- Since 1970, the population has become increasingly concentrated in the unincorporated areas. In 1990, 60 percent of the county's population resided in the unincorporated county.
- Madera County's average household size in 1993 was 3.1 persons per household. The average household size has increased since 1980, with the city of Madera showing the greatest increase. Household sized in the unincorporated areas of the county have remained relatively stable.
- The unincorporated communities of Parksdale, Bonadelle Ranchos-Madera Ranchos, Yosemite Lakes, and the city of Madera have higher percentages of children than the rest of the county, while Oakhurst and Chowchilla have lower percentages than the rest of the county.
- The Oakhurst area has a significantly higher percentage of elderly than the rest of the county. The city of Chowchilla also has a higher percentage of elderly, while Madera Acres, Bonadelle Ranchos-Madera Ranchos, Parkwood, and Parksdale areas area have lower percentages of elderly residents than the rest of the county.
- The population of Madera County is predominantly white. Blacks, American Indians, and Asians comprised small fractions of the population in 1990.
- Over one-third of the population was Hispanic in 1990. The city of Madera and the unincorporated communities of Parksdale and Parkwood have higher proportions of Hispanics than the countywide average. Chowchilla, Oakhurst, and the Yosemite Lakes area have much lower than average percentages of Hispanic population.
- Projections of Madera County's total population prepared by the California Department of Finance (DOF) project a total county population of 171,800 in 2010 and 317,900 in 2040. The General Plan projects a slightly higher rate of growth, with a total county population of 177,100 in 2015.
- In 1990, the largest percentage (28 percent) of Madera County workers were employed in services, mostly in professional and related services (e.g., education, health services). The next largest industry was agriculture and forestry, which employed 16 percent of Madera County workers. Other major employment industries included manufacturing and retail trade.
- Major occupations of Madera County workers in 1990 included administrative support, including clerical (14.6 percent), farming, forestry, and fishing (13.8 percent), precision production, craft, and repair occupations (11.8 percent), and various service occupations.
- From 1980 to 1990, services industries were the fastest growing employers in Madera County, increasing by over 51 percent, followed by construction and mining (47.5 percent), retail trade (44.1 percent), and government (42.3 percent).
- Madera County's agricultural employment fluctuates on a seasonal basis. In 1992, during September, the peak harvest month, 16,950 persons were employed in agriculture. The seasonal low, recorded in March 1992, was 5,550 person employed in agriculture.

- Madera County had more workers than jobs in 1980, 1990, and 1992. As a result, in 1992, for example, at least 8,000 residents were commuting to jobs outside the county, most to jobs in Fresno County.

2.7 PERSONS CONSULTED

Flores, Paula, Analyst, California Department of Finance, Demographic and Census Research Division

Garoupa, Leonard, Planning Director, Madera County

Wolcott, David, Analyst, California Employment Development Department

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2.9 GLOSSARY

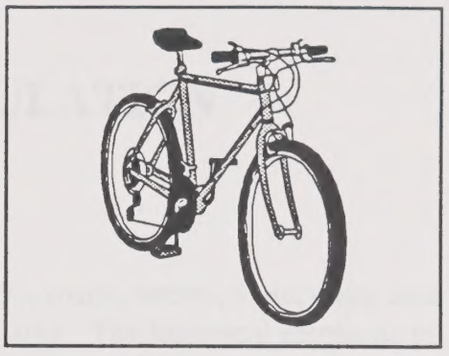
Census Designated Place - Community of 1,000 or more residents, as defined by the U.S. Census.

DOF - California State Department of Finance.

Decennial Census - The United States Department of Commerce, Bureau of Census, conducts a poll of the population and housing characteristics of the United States population on the first day of April in years that end with a zero. This poll is referred to as the "Census of Population." It is the most comprehensive source of demographic information for planning purposes.

Ethnicity - this term can include both the racial and sociocultural background of individuals. The census statistics simply reflect self-identification; that is, it does not denote any scientific classification of biological stock.

Hispanic origin - persons of Hispanic origin are those who classified themselves in one of the specific Hispanic origin categories listed on the census questionnaire form. These categories include Mexican, Puerto Rican, Cuban and Other Spanish/Hispanic origin, which includes persons from Spain and the Spanish-speaking countries of Central and South America, or the Dominican Republic.



CHAPTER 3

TRANSPORTATION AND CIRCULATION

CHAPTER 3

TRANSPORTATION AND CIRCULATION

3.1 INTRODUCTION

A community is both defined and constrained by the network of highways, roads, streets, waterways, and railways that move its residents and goods through and in and out of the area. The historical emphasis of transportation planning efforts in Madera County has been on the development of a street and highway network that would meet the demands of private automobile users. With the growing concern over diminishing fuel supplies and air quality issues, alternative transportation modes, including public transportation, bicycling, and rail facilities, are becoming more important. This chapter discusses Madera County's streets and highways, public transportation, air transportation, goods movement, and scenic highways.

3.2 STREETS AND HIGHWAYS

PHYSICAL CONSTRAINTS AND ROAD SYSTEM

Physical constraints on the county's circulation system are the natural and man-made barriers to travel that limit existing and future roadway connections and alignments, thus constraining the county's access and circulation capability.

Circulation constraints in Madera County vary between the valley region and the foothill/mountain region. In the flat valley of the western county, the major circulation elements are the north-south oriented Highway 99 and railroad tracks that also run north-south roughly parallel to the state highway. The highway and railroad tracks facilitate north-south travel and hinder east-west travel. Access to the north, west, and south of the county is limited by the Chowchilla and San Joaquin Rivers. The Fresno River, which runs generally in a east-west direction, also poses a constraint to north-south travel. Numerous creeks and canals also pose minor constraints to travel in the county.

State Highway 41 is the primary access to the foothills and mountains of Madera County, linking these areas to the Fresno metropolitan area. The mountain area is limited to access through valleys and canyons. There is no direct access to the eastern side of the county over the crest of the Sierra Nevada.

FUNCTIONAL CLASSIFICATION OF ROADWAYS

Madera County's currently includes improvement standards for facilities falling into four functional categories: freeways, arterials, collectors, and local roads. Each type of road serves a specific purpose.

Freeways: Freeways are intended to serve both intra-regional and inter-regional travel. They provide for high speed, through-traffic movement on continuous routes. Freeways provide connections to other regional highways and are capable of carrying heavy traffic volumes. Speed limits on freeways are usually the highest allowed by law. Access to freeways is strictly controlled and accomplished through on/off ramps. They provide no access to adjacent properties.

Arterials: Arterials provide for mobility within the county and its cities. Arterials are designed to carry through traffic on continuous routes and joining major traffic generators, freeways, expressways, and other arterials. Access is less restricted than expressways, although access to and from abutting property is generally prohibited.

Collectors: Collectors provide for internal traffic movement within communities and connect local roads to arterials, and expressways. Collectors are designed to take traffic off of local roads and feed it into arterials, expressways, and freeways. Collector streets require 80 feet of right-of-way and are typically designed to accommodate two lanes of traffic.

Local Roads: Local roads provide direct access to abutting property and connect with collectors, arterials, and expressways. Local roads are typically developed as two-lane undivided roadways. Long term planning is limited to protecting the ability of future developments to extend local roads through existing parcels.

This hierarchy of streets and highways is only a general guide to the classification of roadways which make up the circulation system. Often a street serves a dual function and it is difficult to provide a definitive classification. In addition, the width of a roadway does not always correspond directly to its function in the overall circulation system, although the wider roadways tend to have more regional functions within the overall circulation system.

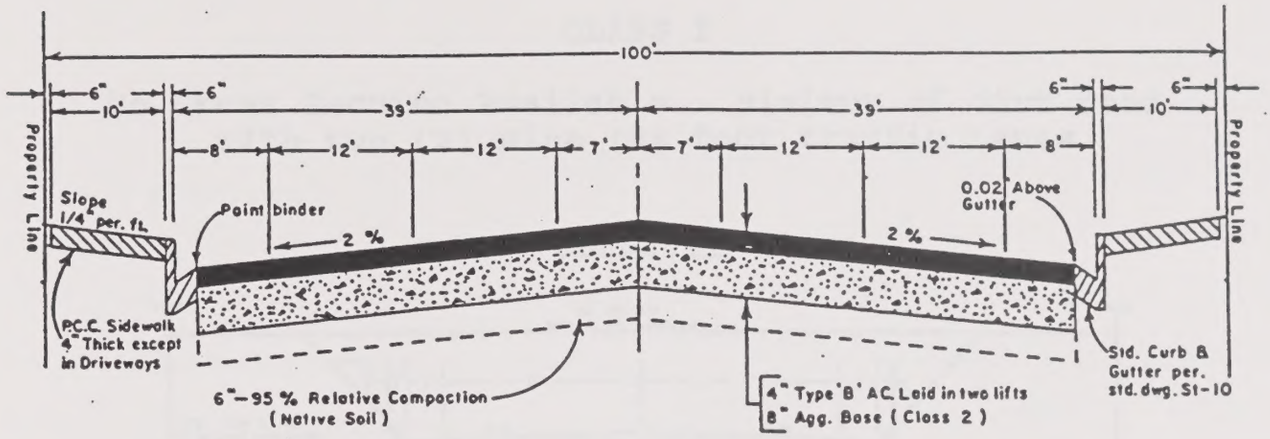
Existing Improvement Standards

Figure 3-1 illustrates the cross sections for Madera County's current improvement standards for arterials and collectors. Improvement standards for local roads are broken into five classes; the standards vary depending on the minimum parcel sizes in the area and the number of parcels to be served by the roadway. Table 3-1 indicates the local roadway standards and Figure 3-2 shows typical cross sections for each class of local roadway.

FIGURE 3-1

MADERA COUNTY ROADWAY IMPROVEMENT STANDARDS

ARTERIAL CROSSECTION



CONTINUOUS TURNING LANE
AND
FOUR TRAFFIC LANES

SCALE: VERT. 1" = 2' 0"
HORIZ. 1" = 10' 0"

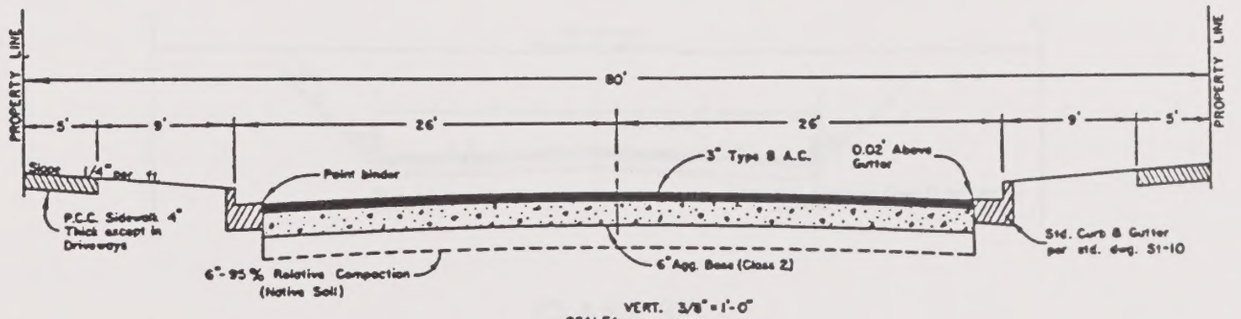
NOTES:

1. ASPHALTIC CONCRETE, AGGREGATE BASE, AND EARTH WORK SHALL CONFORM TO SECTIONS 39,26, AND 19 OF THE STATE STANDARD SPECIFICATIONS LATEST EDITION.
2. THE STRUCTURAL SECTION AS SHOWN SHALL HAVE A MINIMUM SUBSOIL R-VALUE OF 50, FOR R-VALUES LESS THAN 50 THE STRUCTURAL SECTION SHALL BE AS FOLLOWS:

R-VALUE	AC-THICKNESS	AGG. BASE THICKNESS
45 - 49	4"	10"
40 - 44	4"	11"
35 - 39	4"	12"
30 - 34	4"	13"
25 - 29	4"	15"
20 - 24	4"	18"

3. TRAFFIC INDEX = 8
4. MIN. GRADE = .001 ; MAX. GRADE = .05
5. MIN. CROSS SLOPE = 2%
6. MAX. CROSS SLOPE = 5%
7. MIN. CROSS ON WIDENING = 1.5 %
8. DESIGN SPEED = 50 MPH
9. MIN. RADIUS = 850'
10. STOPPING SIGHT DISTANCE = 400'
11. REFER TO STANDARD DRAWING ST-2 NOTE 11.

COLLECTOR CROSSECTION



SCALE: VERT. 3/8" = 1'-0"
HORIZ. 1/8" = 1'-0"

NOTES:

1. ASPHALTIC CONCRETE, AGGREGATE BASE, AND EARTH WORK SHALL CONFORM TO SECTIONS 39,26, AND 19 OF THE STATE STANDARD SPECIFICATIONS LATEST EDITION.
2. THE STRUCTURAL SECTION AS SHOWN SHALL HAVE A MINIMUM SUBSOIL R-VALUE OF 50, FOR R-VALUES LESS THAN 50 THE STRUCTURAL SECTION SHALL BE AS FOLLOWS:

R-VALUE	AC-THICKNESS	AGG. BASE THICKNESS
45 - 49	3"	7"
40 - 44	3"	8"
35 - 39	3"	9"
30 - 34	3"	10"
25 - 29	3"	11"
20 - 24	3"	12"

3. TRAFFIC INDEX = 6
4. MIN. GRADE = .001: MAX. GRADE = .05
5. MIN. CROSS SLOPE = 2 %
6. MAX. CROSS SLOPE = 5 %
7. MIN. CROSS ON WIDENING = 1.5 %
8. DESIGN SPEED = 40 MPH
9. MIN. RADIUS = 550'
10. STOPPING SIGHT DISTANCE = 300'
11. REFER TO STANDARD DRAWING ST-2 NOTE 11.

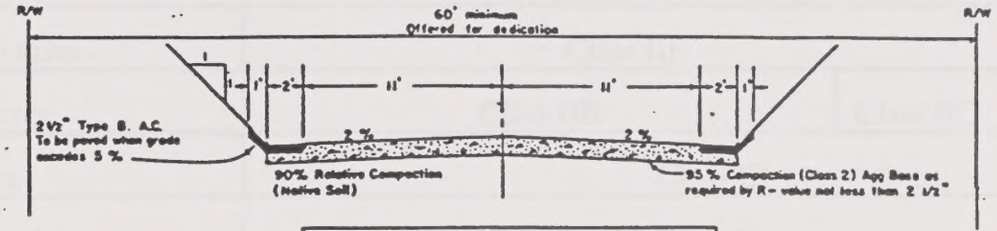
FIGURE 3-2

LOCAL ROAD IMPROVEMENT STANDARDS

CLASS I

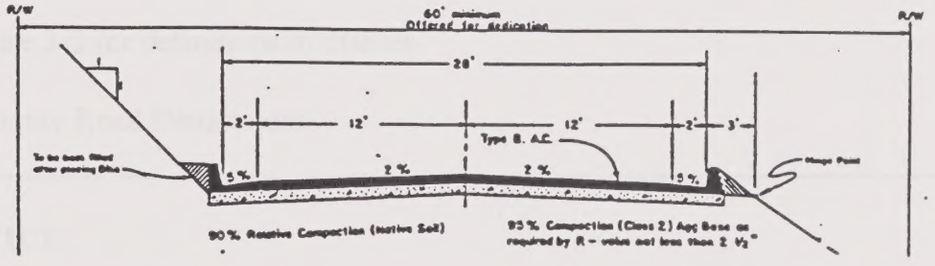
No Cross Section Available. Minimum of dirt road with two (2) nine (9) foot traffic Lanes

CLASS II

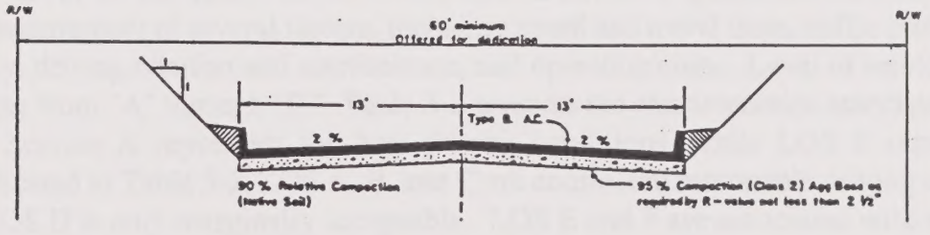


II B	Penetration plus single chip seal
II C	Penetration plus double chip seal

CLASS III



CLASS IV



CLASS V

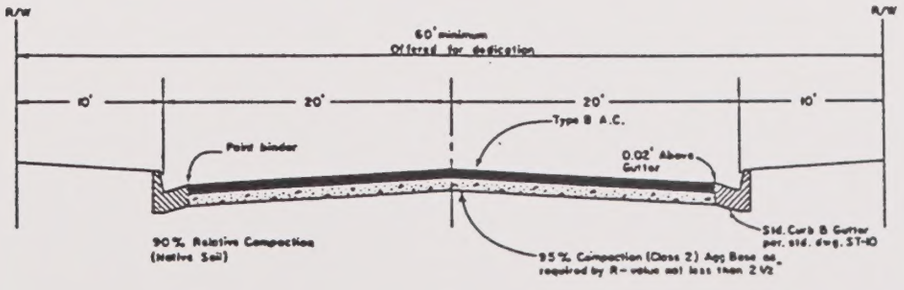


TABLE 3-1

IMPROVEMENT STANDARDS FOR LOCAL ROADS

MINIMUM PARCEL SIZE	NUMBER OF PARCELS TO BE SERVED BY ROAD				
	1-4	5-8	9-12	13-16	16+
160 Acres or more	Class I				
40 acres to 160 acres	Class IIB				Class IIC
5 acres to 40 acres	Class IIB			Class IIC	Class III
1 acre to 5 acres	Class III				
Rural commercial use	Class IV				
Less than 1 acre	Class V				
Urban commercial					

Note: Refer to Figure 3-2 for definitions of classes

Source: Madera County Road Department

LEVEL OF SERVICE

To evaluate traffic operating conditions and to provide a basis for comparison of operation conditions, traffic planners use the "level of service." Level of service (LOS) is a qualitative measure of traffic flow representing the measurement of several factors, including speed and travel time, traffic interruption, freedom to maneuver, safety, driving comfort and convenience, and operating costs. Level of service is identified by letter grades ranging from "A" through "F." Table 3-2 presents the characteristics associated with each LOS grade. Level of Service A represents the best driving conditions, while LOS F represents the worst conditions. As indicated in Table 3-2, LOS A, B, and C are considered reasonable driving conditions to most motorists, while LOS D is only marginally acceptable. LOS E and F are associated with severe congestion and delay and are unacceptable to most motorists.

TABLE 3-2

LEVEL OF SERVICE DEFINITIONS

Level of Service	Traffic Conditions
A	Free flow of vehicles unaffected by other vehicles in the traffic stream
B	Higher speed range of stable flow. Volume 50 percent of capacity or less
C	Stable flow with volumes not exceeding 75 percent of capacity
D	Upper end of stable flow conditions. Volumes do not exceed 90 percent of capacity
E	Unstable flow at roadway capacity. Operating speeds 30 to 35 mph or less
F	Stop-and-go traffic with operating speeds less than 30 mph

For planning analysis, the proportion of roadway capacity used, or volume to capacity (v/c) ratio, is the primary variable correlated to level of service.

For the purposes of *Draft General Plan* analysis, the County has developed a technique of evaluating service level on the basis of "segment capacity." The segment capacity varies by roadway category as shown in Table 3-3, and the relationship between volume/capacity ratio and service level varies according to Table 3-4. Level of service for signalized intersections is defined in terms of Volume/Capacity ratio. A computer program determines the critical movements on each intersection approach and compares the volume on that approach to the capacity of the approach. The resultant V/C ratio of each approach is summed to determine the Volume/Capacity ratio for the intersection as a whole. The V/C ratio is in turn related to Service Level according to Table 3-5. The capacities have been derived from relevant chapters of the 1985 *Highway Capacity Manual*. It should be noted that the *Manual* contains considerable detail on roadway conditions, including width, terrain and other factors; these factors have been simplified and generalized for general planning purposes.

TABLE 3-3

LOS DEFINITIONS FOR SIGNALIZED INTERSECTIONS
(Note: V/C Ratios for Roadway Segments Vary as per Table 3-4)

Level of Service	Description	V/C Ratio
A	Describes operations with very low delay, i.e., less than 5.0 sec per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	Ratio < 0.60.
B	Describes operations with delay in the range of 5.1 to 15.0 sec per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.	= 0.61-0.70.
C	Describes operations with delay in the range of 15.1 to 25.0 sec per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.	= 0.71-0.80.
D	Describes operations with delay in the range of 25.1 to 40.0 sec per vehicle. At level "D", the influence of congestion becomes more noticeable. Long delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	= 0.81-0.90.
E	Describes operations with delay in the range of 40.1 to 60.0 sec per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.	= 0.91-1.00.
F	Describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.	Ratio > 1.00.

Source: Transportation Research Board, *Highway Capacity Manual*, 1980-1985

TABLE 3-4

CAPACITIES PER HOUR PER LANE FOR VARIOUS HIGHWAY FACILITIES

LOS	Freeways	Two-Lane Rural Highways	Multi-lane Rural Highways	Two-Lane County Roads	Multi-Lane County Roads
A	700	120	471	90	140
B	1100	240	943	189	294
C	1550	395	1286	306	476
D	1850	675	1586	530	826
E	2000	1145	1800	900	1400

Source: Dowling Associates, 1994

TABLE 3-5

VOLUME/CAPACITY RATIOS FOR VARIOUS HIGHWAY FACILITIES

LOS	Freeways	Two-Lane Rural Highways and County Roads	Multi-lane Rural Highways and County Roads	Urban Streets
A	0.35	0.10	0.26	0.60
B	0.55	0.21	0.52	0.70
C	0.78	0.34	0.71	0.80
D	0.93	0.59	0.88	0.90
E	1.00	1.00	1.00	1.00

Source: Dowling Associates, 1994

ROADS OF REGIONAL SIGNIFICANCE

Roads of regional significance include state highways and freeways and roadways which serve intercounty and intra-county travel, or access recreation areas. The roadways depicted in Figure 3-3 and described in this section are listed as roadways of regional significance in the *Regional Transportation Plan.*

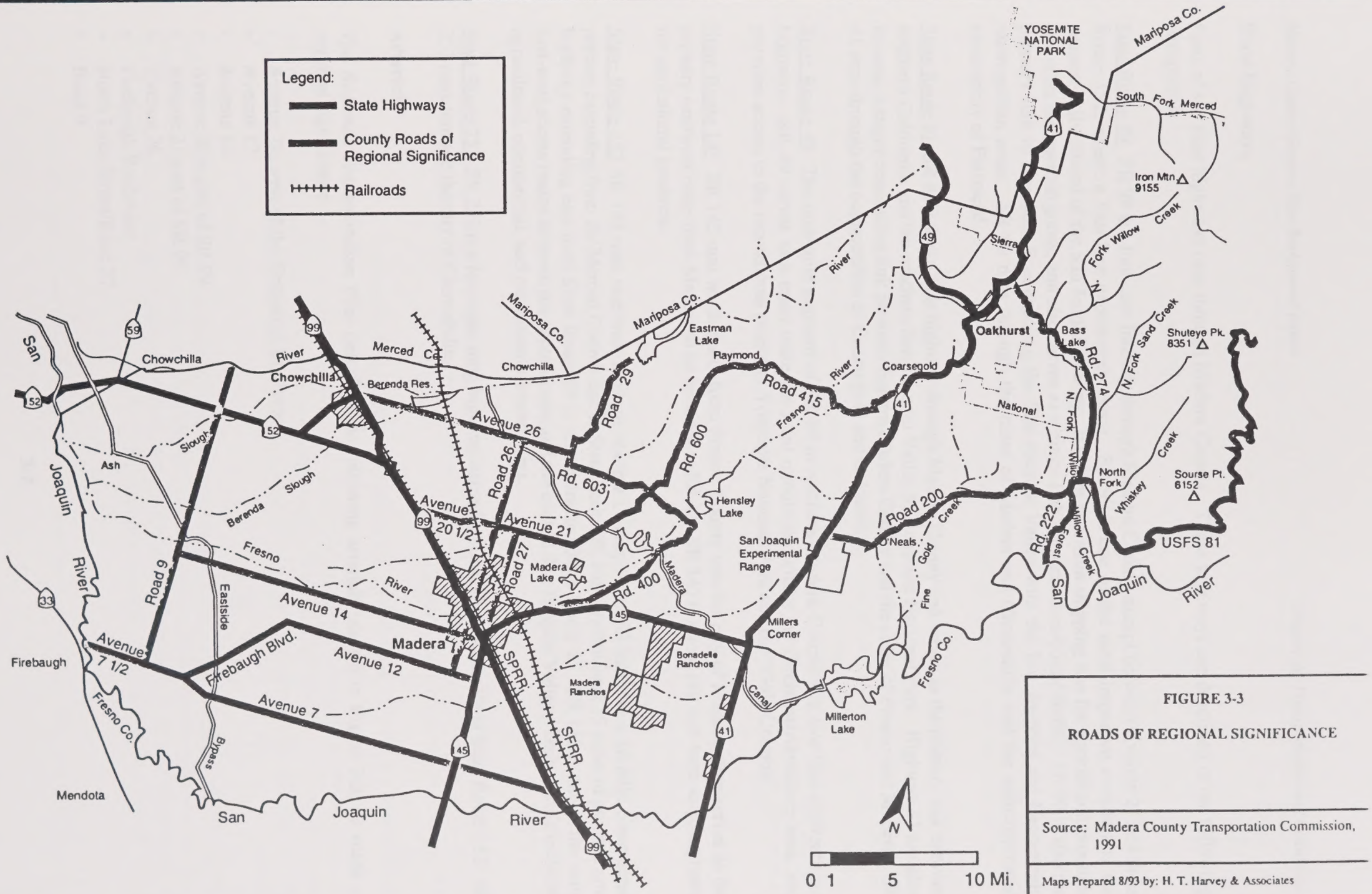


FIGURE 3-3

ROADS OF REGIONAL SIGNIFICANCE

Source: Madera County Transportation Commission, 1991

Maps Prepared 8/93 by: H. T. Harvey & Associates

State Highways

Parts of six state highways pass through Madera County. These highways are described in the following paragraphs.

State Route 99 SR 99 is a four-lane freeway through Madera County except between Avenue 21 and State Route 152, where a four-lane expressway exists. SR 99 is one of the most important corridors to the economic livelihood of the San Joaquin Valley. It serves as a main shipping line for agricultural products and other commercial goods, and also serves as a major link for recreation-bound traffic. SR 99 is also the primary link to Interstate 5, connecting the San Joaquin Valley with the Los Angeles and Sacramento metropolitan areas. SR 99 runs through the cities of Madera and Chowchilla and the unincorporated community of Fairmead.

State Route 41 SR 41 is a two-lane highway through Madera County and serves as the primary link between southern California and the southern San Joaquin Valley to Yosemite National Park. Highway 41 has also become a major commuting link between Eastern Madera County and the cities of Fresno and Madera. SR 41 runs through the communities of Coarsegold and Oakhurst.

State Route 49 The nine-mile segment of SR 49 in northern Madera County is a two-lane conventional highway. SR 49 serves as a main route for local circulation within the Oakhurst/Ahwahnee area, and provides access to the recreational points of Yosemite National Park and the "Gold Country."

State Route 145 SR 145 runs north-south from Fresno County into the city of Madera, then serves as the primary east/west route from Madera to its terminus at SR 41. SR 145 is also a key east-west shipping route for agricultural products.

State Route 152 SR 152 runs east-west through Madera County. SR 152 includes a 16-mile constructed portion extending from the Merced County line to State Route 99, and an additional 15 miles of planned new highway extending east from State Route 99 to unconstructed State Route 65. SR 152 is one of the main east-west access routes between the central coast and the central San Joaquin Valley. Daily traffic includes agricultural, commercial, and recreation-oriented users.

State Route 233 SR 233 is a four-mile long highway extending from State Route 99 to State Route 152. SR 233 runs through the city of Chowchilla.

Arterials

The *Regional Transportation Plan* describes the following arterials (shown in Figure 3-3) as roads of regional significance.

- Avenue 7½ west of the Firebaugh Boulevard
- Avenue 12
- Avenue 14
- Avenue 20½ east of SR 99
- Avenue 21 east of SR 99
- Avenue 26
- Firebaugh Boulevard
- North Lake Street/Road 27
- Road 9

- Road 26
- Road 27
- Road 29
- Road 145 (Millerton Road)
- Road 200 (North Fork Road)
- Road 206 (Friant Road)
- Road 222
- Road 274
- Road 400 (River Road)
- Road 600 (Raymond Road)
- Road 603 (Daulton Road)
- U.S.F.S. 81 (Sierra Vista National Scenic Byway)

EXISTING STREET AND TRAFFIC OPERATING CONDITIONS

An evaluation of existing conditions (1990) was made for the existing Madera County highway network, including streets within the City of Madera that are not formally a part of the County General Plan; they are included in this evaluation for the sake of completeness, since roadway facilities do not stop at city and county boundaries. Figures 3-4 and 3-5 identify those facilities for which Service Level C was exceeded in 1990, the base year for transportation analysis. Level of Service E is currently observed on SR 41 south of Avenue 12. Level D is currently observed in the following locations:

- on SR 41 in the Oakhurst area
- on Road 426 east of Oakhurst
- on SR 41 from Road 200 to Avenue 12
- on Avenue 12 east of Road 36
- on Highway 145 east of the City of Madera
- on Highway 145 south of the City of Madera

In the City of Madera, a number of streets show Levels of Service ranging from D to F on the basis of this evaluation.

As is frequently the case in rural counties, the overall roadway system operates today at a very high level of service. The cases noted above constitute exceptions to the generally excellent service currently provided to Madera County residents and visitors.

CURRENTLY PLANNED STREET AND HIGHWAY IMPROVEMENTS

Currently planned street and highway improvements are those identified by Caltrans and in the *Regional Transportation Plan.* Additional street and highway improvements will be identified as part of the General Plan Update, through the ongoing preparation of area plans, and as part of the *Regional Transportation Plan* Update.

Caltrans prepares route concept reports identifying the planned level of service along state highways, and identifies necessary improvements to maintain the planned levels of service. Planned level of service and identified improvement are described below. Table 3-6 lists planned improvements to state highways in Madera County as identified in the route concept reports.

FIGURE 3-4

ROADWAY LOCATIONS WITH 1990 SERVICE LEVELS OF D OR POORER

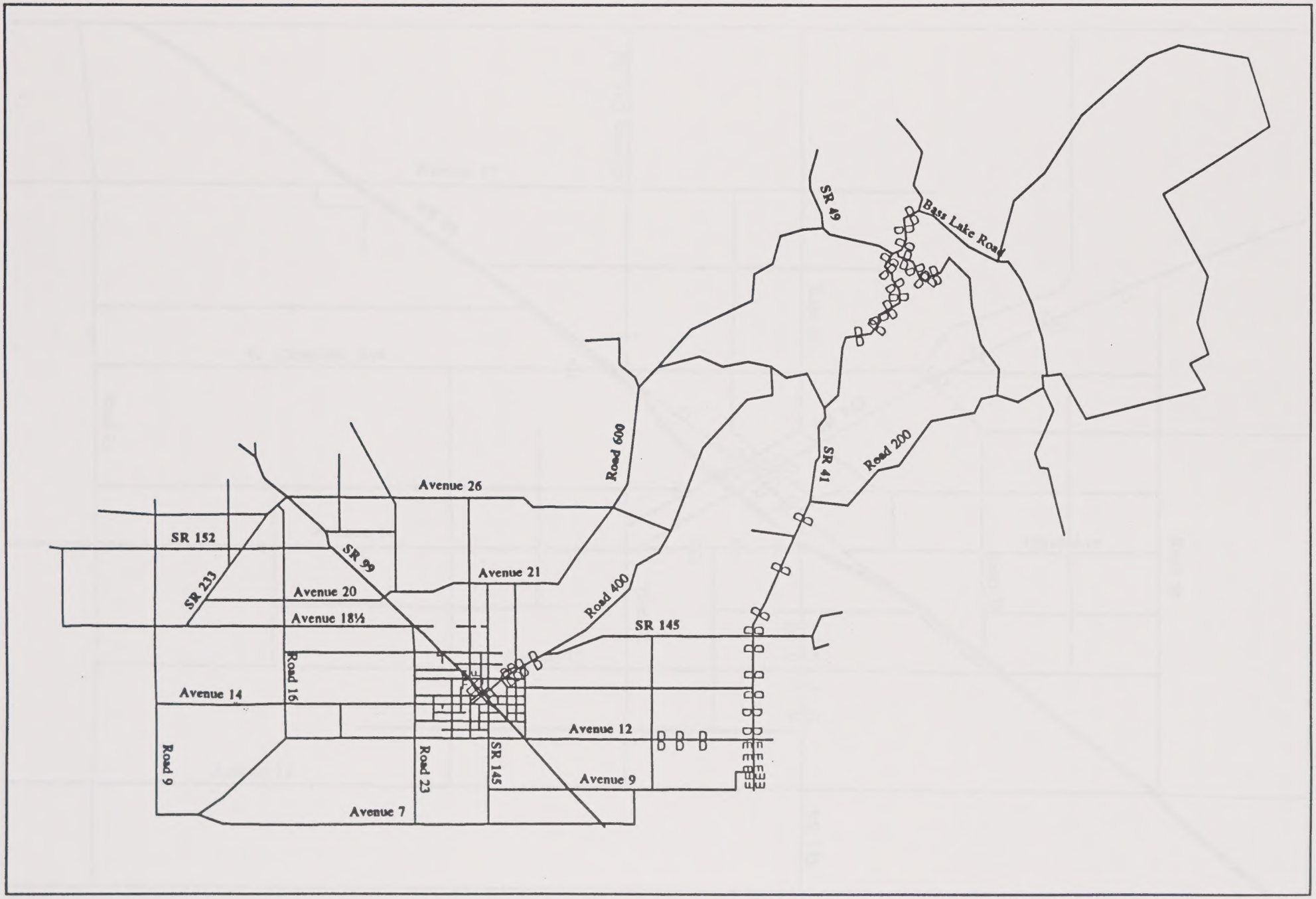
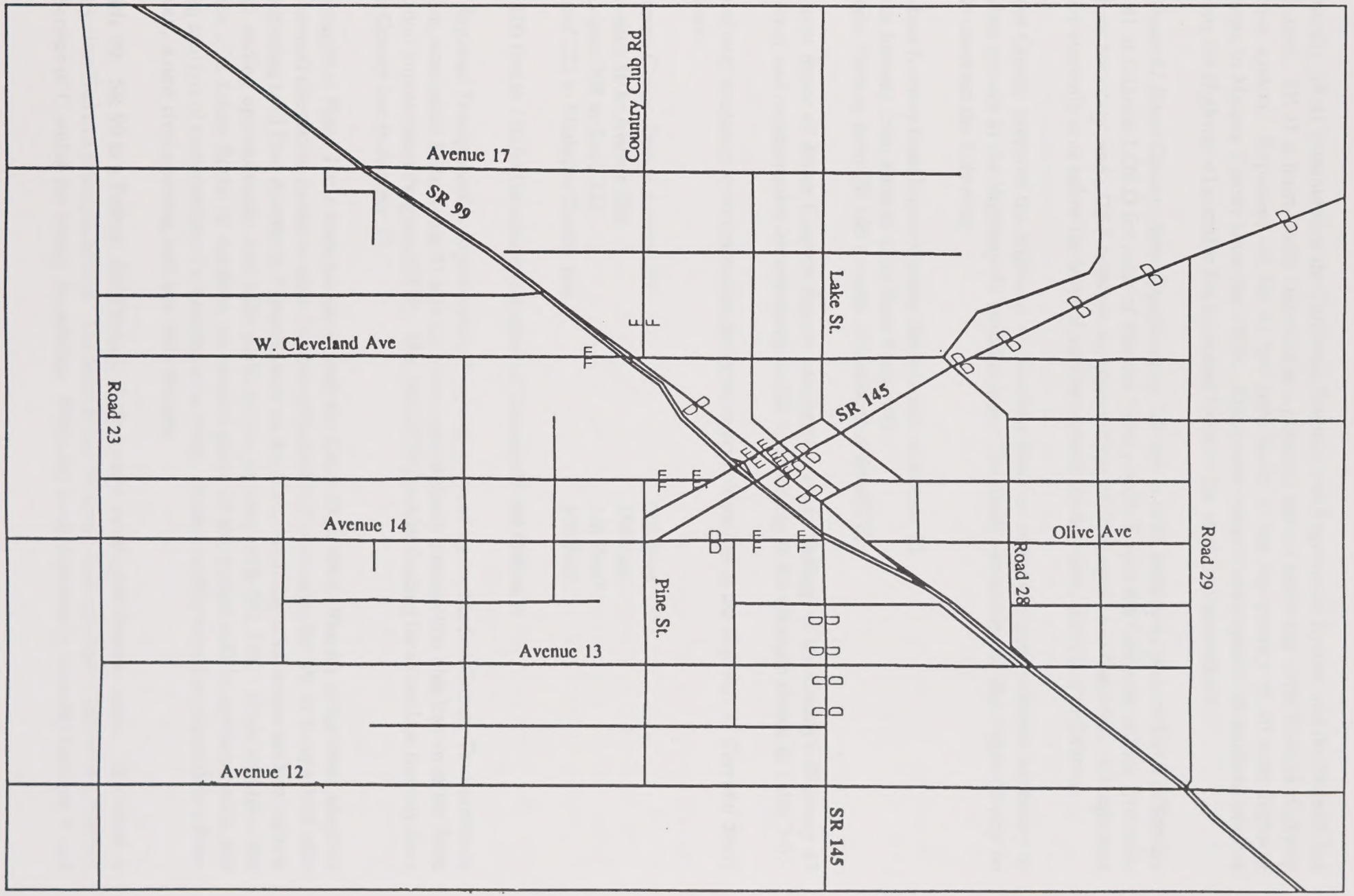


FIGURE 3-5

CITY OF MADERA ROADWAY LOCATIONS WITH 1990 SERVICE LEVELS OF D OR POORER



State Route 41: SR 41 is included in the California Freeway and Expressway System and the Federal Aid Primary System. SR 41 is functionally classified as a principal arterial according to the Federal Highway Classification system. Expansion of SR 41 has been listed as the top priority of all state highway improvements in Madera County since the 1970s. Major new planned development in southern Madera County along the Highway 41 corridor has increased focus on the need for improvement.

The *State Route 41 Route Concept Report*, prepared by Caltrans in 1989, indicates a planned Level of Service along SR 41 as follows: LOS D for most of Madera County; LOS E between Oakhurst and the Yosemite National Park boundary; and LOS F between the communities of Coarsegold and Oakhurst. All segments of SR 41 are currently at or below the level of service planned for the route, according to Caltrans.

In 1989, the County prepared the *Highway 41 Corridor Study* to determine improvements necessary to accommodate growth in the Highway 41 corridor area. The *Study* recommended that rights-of-way be obtained to construct the following:

- Eight-lane freeway from Fresno County line to north of Avenue 12.
- Six-lane freeway from Avenue 12 to State Route 145.
- Four-lane freeway from SR 145 to north of Oakhurst at Road 222.

Caltrans' *State Route 41 Route Concept Report* concurred with the findings of the County's *Highway 41 Corridor Study* and recommended improvements to SR 41 according to the schedule shown in Table 3-6.

The rights-of-way necessary to accommodate the improvements identified in the *Highway 41 Corridor Study* are as follows:

Fresno County line to Avenue 10	208 Feet
Avenue 10 to Avenue 208	194 Feet
Avenue 208 to Road 222	146 Feet*
Road 222 to Mariposa County line	100 Feet

* 100 feet to 110 feet in urbanizing areas of Coarsegold and Oakhurst

The 1991 *Regional Transportation Improvement Program*, prepared by the Madera County Transportation Commission, nominated State Route 41 into the seven-year highway construction plan known as the State Transportation Improvement Program (STIP). The 1992 STIP provides funding for a four-lane freeway from the Fresno County line to Avenue 11.

Caltrans completed Phase 1 of a route adoption study for Route 41 in 1994. Phase 1 of the route adoption examines several alternative routes to accommodate projected traffic volumes for SR 41 from a 10.5 mile corridor beginning at El Paso Avenue in Fresno County on the south, extending north across the San Joaquin River, and ending approximately one mile north of the junction with SR 145. After adoption and preservation of a future Route 41 corridor, the second phase of the project will be environmental and engineering analysis of construction of a transportation route. Such a facility would accommodate a four-lane freeway, a new river crossing, and new interchanges.

State Route 99: SR 99 is a Federal Aid Primary Highway and an adopted freeway route. This route is functionally classified as a principal arterial. The *State Route 99 Route Concept Report* indicates a Planned Level of Service of C within the county boundaries. While the level of service is currently between B and

C throughout the county, increasing traffic volumes will require that a number of improvements be made to maintain the desired LOS.

The right-of-way necessary to accommodate these improvements is 218 feet from the Fresno County line to the Merced County line.

State Route 145: SR 145 is part of the California Freeway and Expressway System, and it is a Federal-Aid Primary Highway functionally classified as a Rural Minor Arterial, except for a three-mile stretch within the city of Madera which is classified as a principal arterial.

The *State Route 145 Route Concept Report*, prepared by Caltrans in 1989, indicates a planned level of service of D throughout the county. However, only those portions of State Route 145 in the city of Madera are in immediate danger of falling below this level. Because of this fact, no long term improvements have been identified for segments of SR 145 in the county.

State Route 233: The section of SR 233 in the county of Madera is functionally classified as a rural major collector. This section is not included in the federal highway system.

The *State Route 233 Route Concept Report*, prepared by Caltrans in 1989, indicates a planned level of service of D over its entire length. The portion of State Route 233 in the unincorporated area of the county currently operates at LOS C. Current growth projections for this area indicate no substantial change in these operating conditions. No long-term improvements have been identified for the segments of State Route 233 in the county.

State Route 49: SR 49 is a Federal-Aid Primary State Highway functionally classified as a rural minor arterial. The *Route Concept Report* for State Route 49 indicates a planned Level of Service of E from SR 41 to Road 628 due to an already high traffic volume expected to expand rapidly in the mountainous highway setting. LOS D is planned over the remainder of the route. Long-term improvements identified by Caltrans as necessary to achieve this LOS are listed in Table 3-6.

The right-of-way necessary to accommodate these improvements is 146 feet from State Route 41 to Road 628 and 100 feet for the remainder.

State Route 152: SR 152 is a Federal Aid Primary route functionally classified as a rural principal arterial.

Current economic and population growth projections for the area along the SR 152 corridor are relatively low. The principal land use in the area is agricultural. Based on these factors, the *State Route 152 Route Concept Report* suggests that it remain as an existing four-lane expressway. No long term improvements have been identified by Caltrans.

State Route 65: SR 65 is an unconstructed, legislative highway. If constructed, it would traverse the east side of San Joaquin Valley roughly paralleling SR 99. The actual alignment has not been adopted. Construction of Route 65 may be necessary in the future if SR 99 reaches capacity on its ultimate corridor, or if intensified growth occurs along the eastern boundary of the valley. No long term improvements or right-of-way protection have been suggested by Caltrans to date.

Planned/Proposed Transportation Improvement Projects

The Madera County Transportation Commission (MCTC) is responsible for preparing and updating a *Regional Transportation Plan* (RTP) every two years. The RTP identifies the transportation needs of the Madera County region, proposes a program of capital and operating improvements, and recommends a package of revenue increases to fund the proposed program. The most recent RTP was adopted by MCTC in 1991; a new plan is under preparation as of May 1994 to be adopted during 1994.

The focus of the RTP in terms of the roadway system is on proposed improvements to State Highway system. Table 3-7 lists the transportation improvement projects listed in the seven-year highway construction plan known as the State Transportation Improvement Program (STIP) and other improvements identified in the RTP. Due to its focus on state highway improvements, there is some overlap with the state highway improvements identified by Caltrans listed in Table 3-6.

TABLE 3-6

PLANNED IMPROVEMENTS
State Highway Segments in Madera County
1990-2010

Roadway Segment	1990	2000	2010
SR 41:			
Fresno County line to Avenue 12	Build four-lane freeway on new alignment		
Avenue 12 to SR 145		Build four-lane highway on new alignment	
SR 145 to Road 28½	Add two lanes to existing two lanes		
Road 28½ to Royal Oaks Dr.	Add two lanes plus operational improvements		
Royal Oaks Dr. to Road 222	Add two lanes plus operational improvements		
Road 222 to Mariposa County line			Widen to 32 feet plus passing lane
SR 49:			
SR 41 to East of Road 621		Add two lanes to existing highway	
East of Road 621 to Mariposa County line		Add passing lanes	
SR 99:			
Fresno County line to SR 145		Add two lanes to existing four lanes	
SR 145 to near Avenue 21½			Add two lanes to existing four lanes
Near Avenue 21½ to SR 152			Convert to six-lane freeway
SR 152 to Merced County line			Add two lanes to existing four lanes

Note: Operational improvements may include, but are not limited to, the addition of shoulders and/or passing lanes
Source: California Department of Transportation, *Route Concept Reports*

TABLE 3-7

CURRENTLY PLANNED/PROPOSED TRANSPORTATION IMPROVEMENT PROJECTS
MCTC Regional Transportation Plan/STIP

PROPOSED STIP PROJECTS (10-Year Highway Improvement List)		
Road-way	**Segment/Location**	**Improvement**
SR 41	Fresno County line to Avenue 12	Widen to four lanes
SR 41	Avenue 12 to SR 145	Widen to four lanes
SR 99	Fairmead area	Construct full interchange south of Avenue 22½
SR 99	Intersection with SR 233	Redesign and reconstruct intersection
SR 99	Avenue 13½	Build off ramp
SR 49		Curve reduction, site distance improvement
MCTC RECOMMENDED PROJECTS		
SR 145	Intersection with SR 99	Study congestion and safety hazards to current intersection configuration. Develop alternative designs
SR 99	SR 233 interchange	Incremental redesign and reconstruction
SR 145	Road 400	Left turn lane at Road 400
SR 49		Curve realignment
SR 99	Avenue 13½	Widen Gateway extension bridge to two lanes with intersection 0.2 miles west of Madera Community Hospital. Construction of southbound off ramp
SR 99	Bridge over SR 99 at Cleveland (Avenue 15½)	Widen bridge to four lanes and improve site distance for off ramps
SR 99	Bridge over Chowchilla River at Merced County line	Widen bridge
SR 99	Between San Joaquin River and SR 145	Additional north and southbound lanes
SR 41	Oakhurst	Widen to four lanes

Source: Madera County Transportation Commission, *Regional Transportation Plan*, 1991.

ROAD IMPROVEMENT AND MAINTENANCE

New development typically results in the generation of additional traffic. Different types of development have varying effects on the road system. Residential development generates primarily private automobile traffic, while commercial and industrial development often generates heavy truck traffic. In order to accommodate this traffic, it is necessary to have mechanisms that enable the County to obtain and maintain the road system.

The County may obtain road right-of-way from subdivisions and parcel maps in one of two ways. The first way is an *Offer of Dedication*, which is used to obtain right-of-way for local or internal subdivision roads. When right-of-way is obtained through the Offer of Dedication process, the developer retains responsibility for improving and maintaining the roadway, unless a special district is formed for road maintenance. Roadways obtained through Offers of Dedication are called "Public Roads." The second way the County may obtain right-of-way is through a *Grant Deed*, which the County utilizes to obtain additional right-of-way for County-owned roads. When right-of-way is grant deeded to the County, the County becomes responsible for improving and maintaining the roadway. Roadways obtained through Grant Deeds are "County Roads."

The County shares the responsibility for maintaining existing roads with developers and land owners. Road maintenance districts or service areas are typically established to fund maintenance costs of roadways offered for dedication during the subdivision and parcel map process. Maintenance districts are usually formed upon the request of a developer. Thereafter, future lot owners are assessed an annual fee and the Madera County Road Department performs the maintenance. The County is responsible for all County roads and Caltrans is responsible for the maintenance of all State Highways.

Funding constraints have limited the ability of the County Road Department to maintain all County roads to the extent desired.

STREET AND HIGHWAY SYSTEM SAFETY

The safety of the street and road network is an important element of the circulation system. Several design features add to the safety of the system: provisions for minimum sight distances, maximum grades, curve radii, road widths, road surfaces, and access control. Before a road is constructed, the County reviews plans for these types of safety features.

In 1992, Section 4290 of the *Public Resources Code* (Fire Safe Guidelines) was incorporated into County Ordinance. The Fire Safe Guidelines mandated that all developments within the State Responsibility Area (SRA) comply with a set of minimum wildfire protection standards. The section specifically affects the street and highways system by setting forth requirements addressing emergency and secondary access, roadway turnouts and turnarounds, construction standards, and driveway provisions. The area north and northeast of the Madera Canal lies within the State Responsibility Area. The State Responsibility Area is mapped and discussed in greater detail in Chapter 7, *Safety*.

FINANCING STREET AND HIGHWAY IMPROVEMENTS

Financing street and highway improvements has become difficult over the last several years. Funding for street and highway improvements has been reduced at the federal, state, and local levels. This lack of funding, combined with an increasingly deficient system, has required the County to use a variety of funding

options. In many cases, significant street and highway improvements require the combination of more than one of the following mechanisms:

Measure A: Local ½ cent sales tax for streets and highways.

State Highway Fund: State funds for State Highway projects.

Forest Highway: State funds for Forest Highway construction.

Forest Reserve: Forest service timber funds for roads.

TDA: Transportation Development Act Funds (State).

Gas Tax: Yearly allocations from State Gas tax.

Motor Vehicle in Lieu: Vehicle registration funds (State).

Local Funds: Permit fees, general fund revenue.

Surface Transportation Program: Federal funds for roads.

With the increasing costs of providing streets and roads to new developments, combined with the decline of public support for additional taxation, the County has recently begun to use other funding mechanisms. The County levies developer impact fees on a number of new residential developments. Impact fees are imposed on new development to recoup a proportionate share of the costs required to accommodate such development. These costs may include such improvements as street widening, signalization, and turn lane construction

A second alternative funding mechanism is Assessment District financing, which involves the formation of one or more districts where specific needed capital improvements have been identified. All the property owners in the district are assessed a proportionate share of the costs of the improvements and only projects within the district are eligible for funding. Because creation of these districts can be required as a condition of development approval, this type of financing is especially beneficial for providing improvements to new developments. While Assessment Districts cannot be unilaterally imposed on existing developments, the Board of Supervisors may sponsor a request for citizen consideration.

3.3 PUBLIC TRANSPORTATION

Madera County's rural, dispersed development pattern does not facilitate the use of public transit. Existing and currently planned public transportation is limited to the cities and to recreation-oriented transit.

PUBLIC TRANSIT

Madera Dial-A-Ride

The Madera transit system is the demand responsive bus service for the City of Madera and outlying communities. This is a publicly funded transit system available to all citizens within the service area. Dial-A-Ride collects passengers at their front doors and delivers them to any location within five miles of downtown Madera. Passengers must make reservations for this service approximately 45 minutes before they

wish to be picked up. Because of this system's limited service area, the Madera transit system is not available to most Madera County citizens.

Madera Ranchos Transit

In the fall of 1992, the County began transit service to the community of Madera Ranchos along Avenue 12. The service was discontinued in 1993 because of poor demand.

PRIVATE BUS OPERATOR

Greyhound

Greyhound offers the only inter-community bus service available in the county. Greyhound makes stops in the cities of Fresno, Madera, and Chowchilla several times each day. Several other recreational tour buses operate in the region, but these are not scheduled nor intended to serve inter-community travel needs.

PROPOSED TRANSIT SYSTEMS

Madera Area Regional Shuttle

This is a conceptual inter-community bus shuttle that would ultimately connect the unincorporated area of Fairmead, the Central California Women's Facility, Cities of Chowchilla and Madera, the proposed State Center Community College campus, the possible University of California campus, and the community of Le Grand in Merced County. The feasibility for operating such a shuttle is dependent upon identifying a stable source of ridership. At such time this source is identified, operations could begin relatively quickly.

Yosemite Area Regional Transit

The Yosemite Area Regional Transit System is a joint project of Mariposa, Merced, and Madera Counties. This regional system crosses county lines to serve a diverse mountain population and the National Park and Forest System. A skeleton shuttle service is operating along State Route 140 through Merced and Mariposa Counties. No service through eastern Madera County is currently available.

Intermodal Facility

A facility providing connections to rail service, inter-city bus service, taxis, transit service, and temporary bicycle storage is planned for downtown Madera. While this facility would be under the control of the City of Madera, it would serve as a focal point for all passenger transportation in the county and would allow travelers entering the county to connect with other transit providers.

PASSENGER RAIL

AMTRAK provides passenger rail service to Madera County residents at one station located approximately three miles east of the city of Madera on Avenue 15½. Trains run three times daily in each direction up and down the San Joaquin Valley. Major destinations include Fresno and Bakersfield to the south, with bus connections to Los Angeles from Bakersfield, and Merced, Turlock, Stockton, Antioch, Martinez, and Oakland to the north, with bus connections in Stockton to Sacramento and San Jose.

AMTRAK currently operates on the Santa Fe rail lines. The AMTRAK station consists of only a parking lot, bus shelter, and metal storage shed, and the station has experienced problems with telephone service and lighting. Madera County is one of several San Joaquin Valley counties supporting a proposal to reroute AMTRAK service onto the Southern Pacific tracks. This shift would bring AMTRAK service directly through the cities of Madera and Chowchilla, and would likely improve ridership due to the ability of county residents to connect with other transportation providers.

BICYCLING

As an alternative to the automobile, bicycles are non-polluting, quiet, inexpensive, and a reasonably available source of transportation. The combination of the bicycle's advantages and the public's increased interest in physical fitness has made the bicycle a much larger part of the transportation system than in the past. While much of Madera County's topography is not suitable for bicycling, bicycles can be used for many short commuting trips and for recreational purposes.

In 1981/1982 the Madera County Transportation Commission adopted the *County of Madera Commuter Bike Plan*, consisting of the *City of Madera Commuter Bike Plan*, *City of Chowchilla Commuter Bike Plan*, and *County of Madera Touring Guide*. These initial plans primarily identified bike routes for commuting riders and suggested improvements necessary to complete a local bikeway system. An important element of the *1982 Commuter Bike Plan* was the inclusion of state highways in Madera County as adopted bicycle routes.

In 1991, the City and County of Madera received funding for a joint project involving the preparation of a comprehensive bike plan. This plan is under preparation as of May 1994. When completed, this plan will address the needs of both commuting and recreational cyclists throughout the county, identify safe and convenient routes to key locations throughout the county, and suggest needed improvements and additions to bikeway routes and facilities.

3.4 TRANSPORTATION CONTROL MEASURES

Air quality in the San Joaquin Basin is an increasing concern. While stationary sources of air pollution can be directly controlled, mobile sources, primarily the single occupant vehicle, are much more difficult to control. The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) is currently preparing a set of "rules" which would give the District the authority to mandate the development and implementation of Transportation Control Measures.

Transportation Control Measures (TCMs) are aimed at requiring major traffic generators to provide information and make alternative forms of transportation available to employees and/or customers. Among TCMs are projects aimed at getting people to ride-share, use available transit programs, walk, ride bicycles, and use park-and-ride sites. While it is evident that the private automobile will continue to be a vital part of the County's transportation system, the development and use of alternative forms of transportation will help to lessen the use of the automobile.

3.5 AIR TRANSPORTATION

Air transportation service in Madera County is provided by a number of private and public airfields serving general aviation and agricultural users. Within Madera County, there are two general aviation, publicly-owned municipal airports and 32 private airstrips; scheduled passenger service is available from either municipal airport. Commercial flights to distant or out-of-state destinations are available at Fresno Air

Terminal, approximately 25 miles southeast of the city of Madera. Limited connecting service to other cities is also available in Merced County at Merced Municipal Airport.

State law encourages public access airports to develop Airport Land Use Plans, designating airport vicinity land use and clear zones. Such plans are to be adopted by the County's Airport Land Use Commission (ALUC). The Madera County ALUC adopted the *Airport Land Use Compatibility Plan* in November 1993, which applies to the Madera Municipal Airport and the Chowchilla Municipal Airport and provides guidance for ALUC review of proposed new airports and heliports.

MADERA MUNICIPAL AIRPORT

The Madera Municipal Airport is located within the Madera city limits and is owned and operated by the City of Madera. The airport is located in the northwest part of the city, approximately three-quarters of a mile from Highway 99. The Madera Municipal Airport serves single and twin-engine, piston aircraft, twin-engine turbo prop aircraft (both business and airline training), and less frequently, turbojets and helicopters. An aerial applicator (crop duster) is based at the airport.

Madera Municipal Airport has two paved runways. Runway 12-30 is 4,500 feet long and 150 feet wide, with gross weight strength of 30,000 pounds. It is lighted for night operations and equipped with a visual approach slope indicator. This runway has a full-length parallel taxiway and two connecting taxiways. Runway 7-25 is 3,980 feet long and 150 feet wide, with gross weight strength of 12,000 pounds. The secondary runway is in service for restricted daylight operations and has no lighting. Aerial applicator aircraft use runway 7-25 exclusively.

Planned improvements to the airport include additional T-hangars, extension of Runway 12-30, and an Instrument Landing System. Long-term improvements include development of a third runway parallel to Runway 12-30.

Approximately 100 aircraft are based at the airport with annual operations estimated at 65,000 in 1989. Annual and average daily operations by aircraft type in 1989 and projected operations for the year 2010 are listed in Table 3-8.

TABLE 3-8

MADERA MUNICIPAL AIRPORT OPERATIONS
1989 and 2010

Aircraft Type	1989			2010		
	Annual	Average Day	Percent	Annual	Average Day	Percent
Single engine propeller	55,700	152.60	85.7%	81,838	224.21	81.8%
Ag Aircraft	3,000	8.22	4.6%	3,000	8.22	3.0%
Light Twin-Engine, Piston (e.g, Beech Baron)	4,340	11.89	6.7%	8,832	32.42	8.8%
Light Twin-Engine, Turboprop (e.g, Cessna Conquest)	1,860	5.10	2.9%	3,944	10.81	3.9%
Medium Twin-engine Turboprop (e.g., Saab 340)	--	--	--	493	1.35	0.5%
Small Business Jet (e.g, Cessna Citation)	100	0.27	0.2%	493	1.35	0.5%
Medium Business Jet (e.g, Lear 35)	--	--	--	1,400	3.84	1.4%
Total	65,000	178.08	100.0%	100,000	282.20	100.0%

Source: Madera County Airport Land Use Commission, *Airport Land Use Compatibility Plan - Madera County Airports*, November 1993

The City of Madera has an adopted Airport Master Plan which governs development of the airport, consistent with the ALUC's *Airport Land Use Compatibility Plan.*

CHOWCHILLA MUNICIPAL AIRPORT

The Chowchilla Municipal Airport is located at the southeast end of the city of Chowchilla. The Chowchilla Airport serves single engine and light, twin-engine propeller aircraft. A significant percentage of the operations by single-engine aircraft are by aerial applicator (crop duster) aircraft. Because the airport's location near residential development, aerial applicator aircraft normally use tight landing and departure patterns to avoid overflying residences.

The airport has one paved runway. Runway 12-30 is 3,250 feet long and 60 feet wide, with gross weight strength of 13,500 pounds. It is lighted for night operations, and equipped with a visual approach slope indicator.

Planned improvements to the airport include additional T-hangars and a card lock gate. Approximately 15 aircraft are based at the airport with annual operations estimated at 18,200 in 1989 and projected at 21,000 in the year 2011.

PROPOSED EASTERN MADERA COUNTY AIRPORT

Since the early 1960s, Madera County has been involved in airport site planning to satisfy the need for a public use, general aviation airport in Eastern Madera County. After the Bass Lake Airport was closed in the 1960s due to safety hazards and inability to expand, the possible siting of a new airport near Oakhurst was suggested. Such an airport could serve the following functions:

- Provide air access to the communities of Oakhurst, Bass Lake, North Fork, and Ahwahnee
- Provide emergency and medical evacuation services and an operation base for the Sheriff's Department search and rescue operations
- Provide a fog free alternative airport during the frequent and prolonged winter fogs which close operations at the lower elevation airports in Fresno, Madera,and Chowchilla
- Accommodate recreation-oriented traffic to support business and commercial transportation and services for the Bass Lake area
- Serve as an air transportation focal point for visitors to Yosemite National Park
- Attract new and diversified industries to the Eastern County area

The County applied for and received a grant from the Federal Aviation Administration for the preparation of a feasibility study and proposed site plan. In 1990, the County retained consultants to prepare a Site Identification and Feasibility Study. This study initially identified 19 possible sites for a new airport, and reduced the list to two sites based on further evaluation. The two sites are the Allen Ridge site, identified as a possible location for some time, and the Veater Ranch site, which is no longer considered as a viable site as it has been approved for residential development. The Allen Ridge site was recommended by the consultant as the preferred site to continue the feasibility study.

The Site Identification and Feasibility Study evaluated two alternatives for the construction of an airport. At a minimum, the site must accommodate a Basic Utility State II airport to accommodate essentially all single-engine airplanes plus most small- to medium-size twin-engine aircraft, including some typically used for air taxi service. Alternatively, a General Utility State II airport could accommodate the entire single- and twin-engine propeller aircraft fleet weighing less than 21,500 pounds, and would also typically be capable of accommodating business jet and commuter airline aircraft with passenger capacities of up to 30 seats.

No decision concerning development of an airport has been reached as of May 1994. If the County decides to move ahead with construction of an airport, preparation of an environmental impact report and site master plan would be necessary. Federal, state, and local funds, as well as private investment, would be necessary to construct an airport facility.

3.6 GOODS MOVEMENT

TRUCK TRANSPORT

Goods movement is an integral part of the circulation system in Madera County. While large trucks are necessary for the delivery of agricultural goods, products, and materials, their size and weight often lead to excessive wear and traffic congestion. Because of the county's agriculturally-oriented economic base, however, it is not possible to limit this type of traffic to specific routes. In an effort to mitigate this situation, certain routes have been identified as especially suitable for heavy-truck traffic (see Figure 3-6). Many bridges in the county have also been identified as "unsafe for overweight" as listed in Table 3-9. In spite of these mitigations, the problems associated with truck traffic will continue to be a problem in the county, especially during the harvesting season.

TABLE 3-9

BRIDGES UNSAFE FOR OVERWEIGHT

Road 5½ at Chowchilla River
Road 8 at Chowchilla River
Road 13 at Chowchilla River
Road 13 at Berenda Slough
Road 17½ at Berenda Creek
Road 19 at Chowchilla River
Road 20 at Cottonwood Creek
Road 22 at Dry Creek
Road 23 at Cottonwood Creek
Road 23 at Dry Creek
Road 23½ at Cottonwood Creek
Road 24½ at Cottonwood Creek
Road 28 at Cottonwood Creek
Road 28½ at Dry Creek
Avenue 9 at Cottonwood Creek
Avenue 10 at Cottonwood Creek east of Road 23
Avenue 10 at Cottonwood Creek west of Road 24½
Avenue 12 at Eastside Bypass
Avenue 16½ at Dry Creek
Avenue 17½ at Berenda Creek east of Road 17
Avenue 18 at Berenda Creek
Avenue 20 at Berenda Slough
Avenue 20½ at Dry Creek
Avenue 21 at Eastside Bypass
Avenue 21½ at Berenda Slough
Avenue 27½ at Madera Canal
Road 210 at Willow Creek
Road 210 at Fine Gold Creek
Road 210 at Ryans Creek
Road 221 at PG&E Flume
Road 222 at San Joaquin River
Road 225 at San Joaquin River
Road 225 at Castle Creek
Road 229-A at North Fork Willow Creek
Road 406 at Mud Spring Creek
Road 407 at Willow Creek
Road 407 at West Fork Willow Creek
Road 411 at Willow Creek
Road 423 at Rancheria Creek
Road 425-B at China Creek
Road 432 at Willow Creek
Road 600 at Madera Canal
Road 602 at Daulton Creek
Road 613 at Chowchilla River
Road 628 at Peterson Creek
Road 630 at Lewis Creek
Road 800 at Willow Creek
Road 800 at Striped Rock Creek
Road 800 at Middle Fork Chowchilla River
Road 810 at Chowchilla River
Clark Street at MID Canal
Santa Fe Drive at Ash Slough

Source: Madera County Road Department

FREIGHT RAIL

Existing freight rail facilities in Madera County include the Santa Fe Railroad and the Southern Pacific Railroad, both of which run the full length of Madera County and provide several spurs to industrial areas near the cities of Madera and Chowchilla. These facilities provide for the delivery of raw materials, goods, and products into and out of the County. In 1993, Southern Pacific operated approximately 20 daily freight trains. Santa Fe operated approximately 20 freight and eight passenger trains in 1993.

3.7 SCENIC HIGHWAYS

While assessing the value of scenic resources, natural wildlife and vegetation, and Madera County's advantageous location near Yosemite, designation of routes as "scenic" must be considered to promote tourism and economic development. A county's application for eligibility or official designation provides the opportunity for linkage with all of California's State and County Scenic Highways system. Scenic route "poppy" signs are placed and maintained along the scenic highway, indicating a beginning and an end to each route.

As of 1992, there were no officially designated state or county scenic highways in Madera County. The only eligible state scenic highways route, though not officially designated, is Highway 49 from its intersection with Highway 41 at Oakhurst north to the Mariposa/Madera County line.

Local governmental agencies must meet minimum standards for the "complete highway" to be designated an official county scenic highway. A "complete highway" is the incorporation of not only safety, utility, economy, but also beauty into its concept. Aesthetics are incorporated in the planning and design process with special attention to the impact of the highway on the landscape as well as the highway's visual appearance. County roads are declared official County Scenic Highways by the County Board of Supervisors when authorized to do so by Caltrans.

Additionally, Scenic Byways are federal scenic routes designated by the U.S. Forest Service involving U.S. Forest Service land along its route. The Sierra Vista Scenic Byway is a recently designated scenic route within Madera County. It loops Minarets Road north of North Fork, Beasore Road north of Bass Lake, and Sky Ranch Road north of Oakhurst (see Figure 3-7). Linking county and state scenic highways with U.S. Scenic Byways can serve to provide a continuous route and consistent access for residents and tourists to drive through the county's scenic areas.

A scenic highway includes the pavement of traveled roadway, as well as the entire publicly-owned right-of-way. Accessory uses include bridges, drainage facilities, public utilities, walkways and trails, protective planting and landscaping, rest areas and scenic vista points. A scenic corridor can be described as "the view from the road," including a distant panorama and/or the immediate roadside area. A corridor should encompass the outstanding natural features and landscapes which qualify the highway as "scenic" and should be uninterrupted. The scenic corridor through which the highway passes should have consistent scenic, historic, or aesthetic value during all seasons. Therefore, protection of any scenic corridor involves land adjacent to the highway or road right-of-way. Factors to consider in preserving scenic resources include regulation of land use and density of development, detailed land and site planning, control of outdoor advertising, control of earthmoving and landscaping, and the design and appearance of nearby structures and equipment.

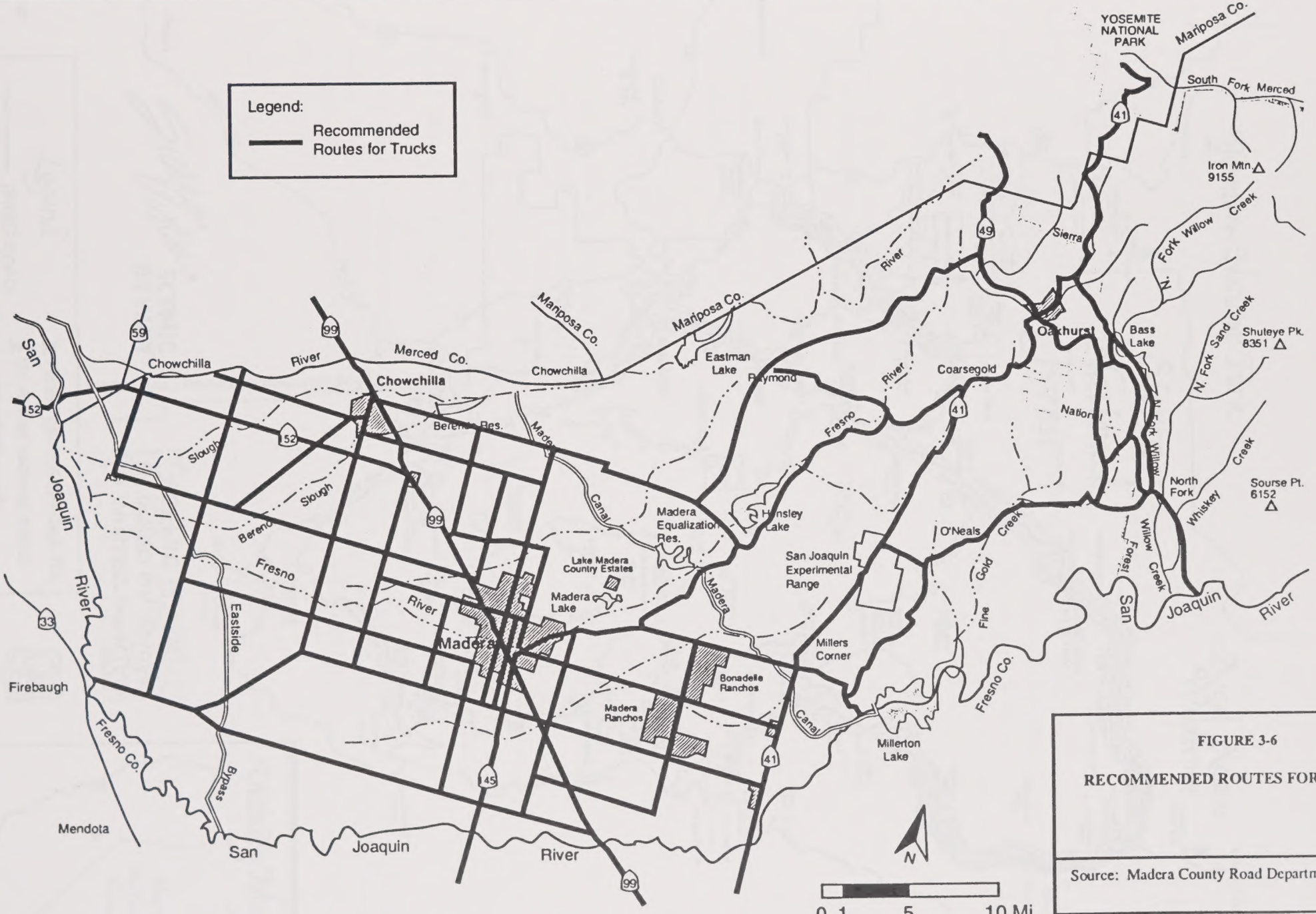


FIGURE 3-6

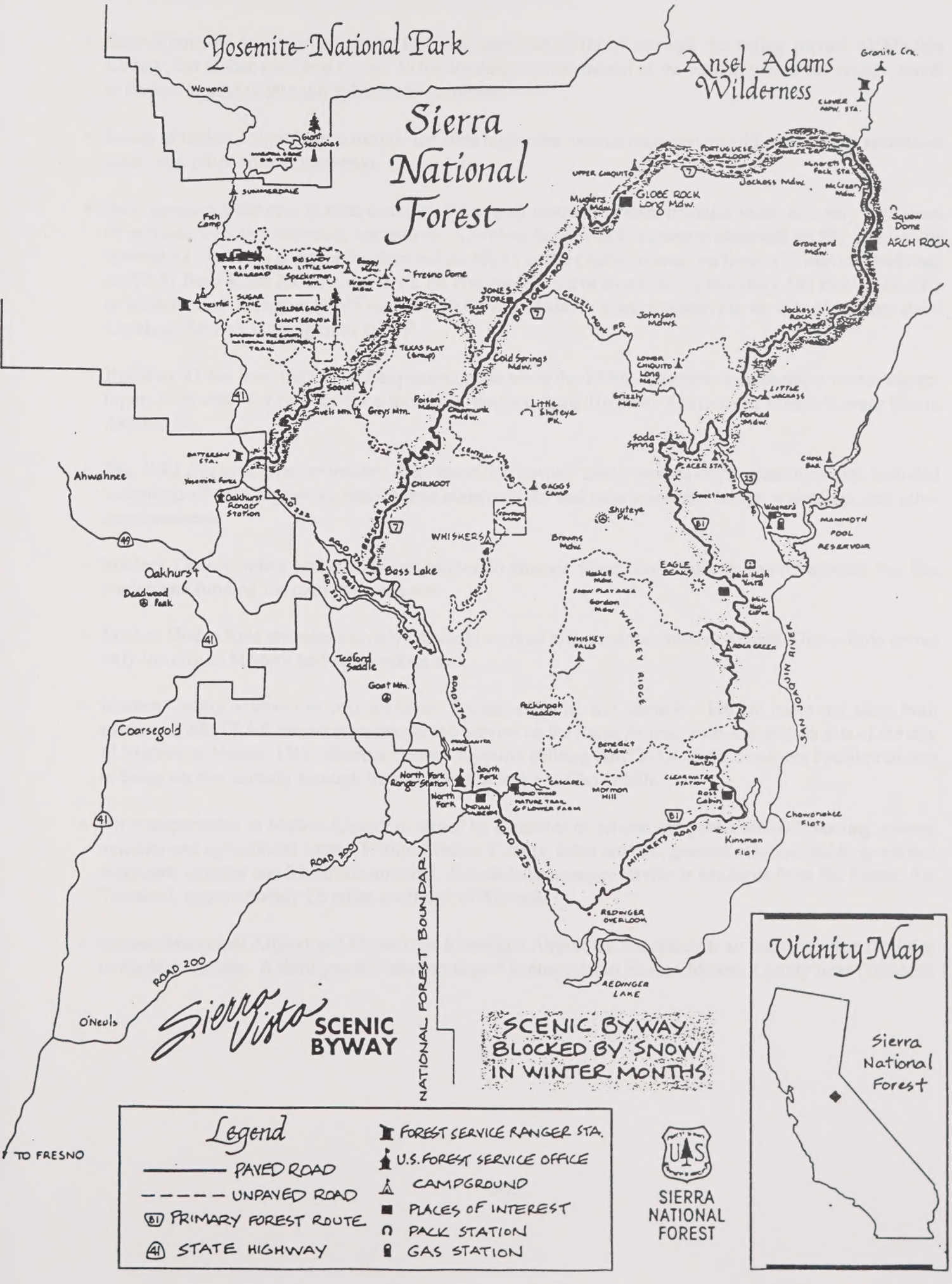
RECOMMENDED ROUTES FOR TRUCKS

Source: Madera County Road Department, 1992

Maps Prepared 8/93 by: H. T. Harvey & Associates

FIGURE 3-7

SIERRA VISTA SCENIC BYWAY



3.8 FINDINGS

- State Route 99 and railroad tracks facilitate north-south travel through the valley portion of Madera County, but hinder east-west travel. In the foothills and mountains of the eastern part of the county, travel is limited to access through valleys and canyons.

- Roads of regional significance include the state highways, arterial roadways providing access to recreation areas, and other arterial roadways.

- As is frequently the case in rural counties, the overall roadway system operates today at a very high level of service, with the following exceptions: Level of Service E is currently observed on SR 41 south of Avenue 12. Level D is currently observed on SR 41 in the Oakhurst area, on Road 426 east of Oakhurst, on SR 41 from Road 200 to Avenue 12, on Avenue 12 east of Road 36, on Highway 145 east of the City of Madera, and on Highway 145 south of the City of Madera. Some roadways in the city of Madera show Levels of Service ranging from D to F.

- Highway 41 has been the focus of expansion plans since the 1970s. Caltrans is preparing a route concept report to provide for funding for a four-lane freeway along Highway 41 from the Fresno County line to Avenue 11.

- The *1991 Regional Transportation Plan* identified needed transportation improvements which included widenings of state highways, interchange constructions and improvements, bridge widenings, and other improvements.

- Madera County relies on various techniques to finance street and highway improvements, but has inadequate funding for road maintenance.

- Madera Dial-a-Ride provides the only demand response system in the county. Madera Dial-a-Ride serves only the city of Madera and surrounding area.

- Madera County is served by two rail lines: Southern Pacific and Santa Fe. Freight trains run along both tracks and AMTRAK provides passenger rail service on the Santa Fe line, with one station east of the city of Madera at Avenue 15½. Madera County supports shifting AMTRAK to the Southern Pacific rail line to bring service directly through the cities of Madera and Chowchilla.

- Air transportation in Madera County is served by a number of private and public airfields serving general aviation and agricultural users. Within Madera County, there are two, general aviation, publicly-owned municipal airstrips and 32 private airstrips. Scheduled passenger service is available from the Fresno Air Terminal, approximately 25 miles southeast of Madera.

- Madera Municipal Airport and Chowchilla Municipal Airport are the principal air transportation facilities in Madera County. A third general aviation airport is proposed in Eastern Madera County near Oakhurst.

3.9 PERSONS CONSULTED

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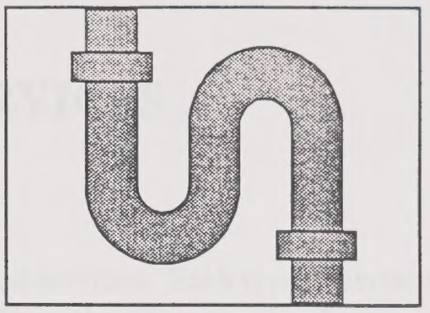

CHAPTER 4

PUBLIC FACILITIES AND SERVICES

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PUBLIC FACILITIES AND SERVICES

4.1 INTRODUCTION

Development is dependent on a complicated network of public facilities and services. Each type of service has a unique set of constraints and must adapt to growth and change differently. This chapter discusses public facilities, including water, sewage collection and treatment, drainage, and solid waste. The chapter also describes public services in the county, including general government, law enforcement, fire protection, public utilities (gas and electricity, telephone, cable television), schools, and libraries. The various systems and their capacities are described, and their implications for the general plan are discussed.

4.2 WATER

WATER AGENCIES

The delivery of surface water in Madera County is managed primarily by irrigation districts, while groundwater wells for municipal use is regulated and permitted by local governments. Surface water in the county is managed by four irrigation districts within the county that manage delivery of water to agricultural users. Madera Irrigation District (MID) is the main surface water supplier in the county, covering the most acreage (approximately 129,000 acres) and managing the Madera Canal for the U.S. Bureau of Reclamation. Chowchilla Water District (CWD) also supplies water to a substantial amount of acreage within the county, and to some areas in Merced County to the north (the district covered approximately 79,000 acres in 1991). The Chowchilla Water District uses water from the Central Valley Project's Millerton Lake at Friant Dam, as well as Buchanan Reservoir on the Chowchilla River. In addition to the two major agencies, Gravely Ford and Clayton Water Districts also operate in the county, although they cover much smaller areas and only have rights to excess supply in the wet years; these are essentially inactive agencies. The Alviso and Sierra Water Districts are considered inactive. District boundaries are depicted in Figure 4-1.

The County does not have direct regulatory control over water delivery by the water districts, which deliver water according to contracts with the federal government and individual growers. The implications of water use in the county for irrigation is discussed in Chapter 6, *Natural Resources.*

COMMUNITY WATER SYSTEMS

Table 4-1 categorizes 11 major community water systems in the county by size, source, and treatment practices, if any. These water systems, which have a minimum of 200 service connections, are regulated by the State Department of Health Services, Division of Drinking Water. Under State regulations, each system is inspected annually and monitored for possible contamination and necessary system improvements.

Of the 11 systems reviewed, 10 are served by groundwater (wells) and one is served by surface water with well backups. All of the systems operate reasonably well with only minor operating deficiencies. As of mid-1993, a number of the systems were attempting to have new wells permitted by the State Department of Health Services and several were also being required to add operational improvements (e.g., emergency chlorination equipment). These 11 systems represent the major community systems in the county. Additional large systems exist, such as the Madera Prison Water System and the systems serving State and

National Parks in Madera County. These systems do not, however, generally have a direct impact on most county citizens.

In addition to the major community water systems outlined in Table 4-1, approximately 44 small community systems, consisting of systems with between 15 and 199 service connections, are administered and regulated by the County Department of Environmental Health. Of these smaller systems, 23 have between 15 and 50 connections, 19 have between 51 and 100 connections, and 2 have between 101 and 199 connections. The vast majority of these systems also use wells as the primary water source, with a smaller number of systems relying on surface water and natural springs.

TABLE 4-1

LARGE WATER SYSTEMS IN MADERA COUNTY

Water Purveyor	Service Connections	*Rate of Delivery (MG/Year)	Source(s) of Water	Treatment Practices	Storage Available (Gal)
Rolling Hills Water	301	157	2 Active Wells	Chlorination	No Storage
Indian Lakes Estates	394	54	4 Hardrock Wells	No Treatment	160,000
Parksdale Water	422	158	2 Vert. Deep Wells	No Treatment	No Storage
Parkwood Water	511	122	3 Active Wells	No Treatment	No Storage
Madera Ranchos Water	719	Unknown	3 Active Wells	No Treatment	15,000-30,000
Bass Lake Water Co.	771	105	Surface & Wells	Chlorination	733,000
Hillview Water	1,089	183	27 Hardrock Wells	Iron/Mag. Removal	1,959,600
Yosemite Springs	1,250	206	10 Hardrock Wells	No Treatment	3,100,000
Madera Valley Water	1,525	456	4 Active Wells	No Treatment	No Storage
Chowchilla Water	2,000	917	7 Active Wells	No Treatment	60,000
Madera Water	8,919	3,189	12 Active Wells	No Treatment	1,000,000

* Rate of Delivery is from most recently completed annual inspection conducted by State Department of Health Services, Office of Drinking Water. Rate is expressed in million gallons per year.

** Hillview Water Company consists of four separate water service systems operating as single utility: Raymond Water System, Coarsegold Highlands, Hillview/Goldside, and Oakhurst/Sierra Lakes.

Source: Madera County Engineering Department, 1993

The existing community water systems appear to be functioning well and meeting the needs of current users. However, it is likely that improvements to these systems will likely be required in the future. While improvements to public water systems in Madera County can be made in response to regulatory mandates and operational deficiencies, new development in the county will probably be the driving force behind system improvements. As communities continue to grow beyond the capacity of the water systems that serve them, it may be necessary to expand the existing systems, or to form entirely new water systems.

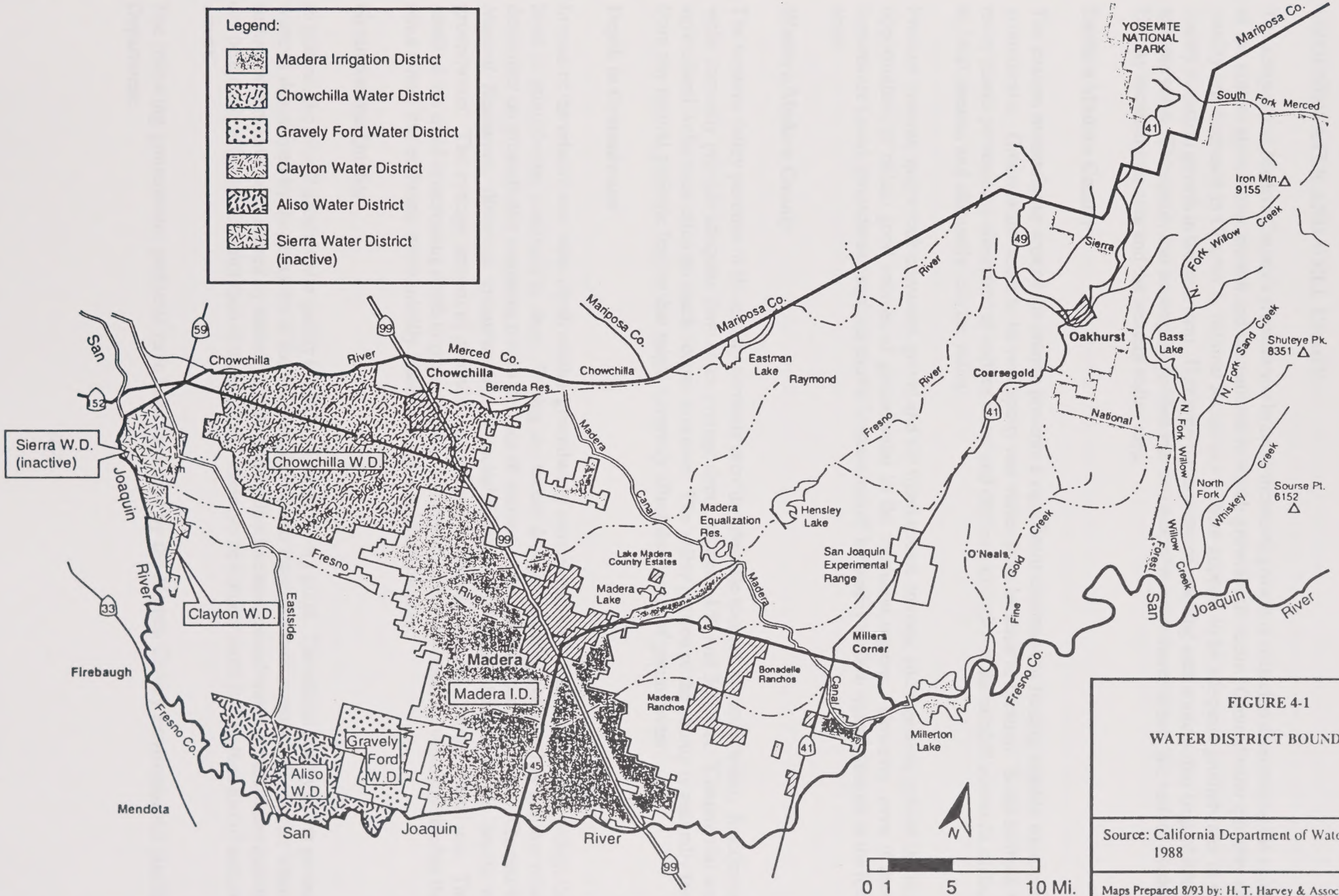

FIGURE 4-1

WATER DISTRICT BOUNDARIES

Source: California Department of Water Resources, 1988

Maps Prepared 8/93 by: H. T. Harvey & Associates

GROUNDWATER AND WELL USAGE

The adequacy of Madera County's groundwater to serve increased growth is critical in determining the ability of the area to absorb new growth and the patterns in which growth will occur. Groundwater quantity and quality are discussed in Chapter 6, *Natural Resources*. There appears to be adequate groundwater in the county to sustain growth in the near term. However, the expense of reaching such sources may be prohibitive in some areas. The county can be roughly divided into two groundwater resource areas: the eastern Madera County mountainous area and the western valley area.

Eastern Madera County

The eastern mountainous area of the county presents a significant challenge in finding reliable sources of groundwater. Groundwater tends to be very spotty and varies from location to location. Solid bedrock in many places prevents the absorption of surface water and carries a majority of the rainfall across its surface to local streams and ultimately into the valley.

Fracture systems, major rock crevasses, gravel and silt filled stream courses, and meadows present the best opportunities to obtain good sources of groundwater in the mountain regions. However, even if these features are found, groundwater supplies can be "contaminated" by nearby surface water infusions in the rock areas.

Western Madera County

The western valley portions of the county currently provide adequate sources of groundwater. Residential wells currently provide adequate flow at an average depth between 150 and 300 feet. Commercial and agricultural wells must often go much deeper, however. The valley portion of the county is generally free from any natural geologic feature that might adversely affect the supply of groundwater.

Depth to Groundwater

In spite of the relative ease with which reliable groundwater sources can be found in the western valley, the level of groundwater continues to drop. During the recent drought years, agriculture has become more dependent on groundwater resources due to the lack of surface water for irrigation purposes. Chapter 6, *Natural Resources*, discusses groundwater and includes maps indicating changes in the depths to groundwater. The average amount of groundwater recharge is far less than the average annual use. The result of this trend is increasing depth to groundwater. As the water table declines, it eventually reaches the point where it is no longer economically feasible to reach reliable sources.

Groundwater Quality

In general, the overall groundwater quality in Madera County is very good. The natural quality of the ground water is determined by the character of the geologic formations through which it passes. However, where surface waters have been altered by human activity before they become ground water, groundwater quality can be directly affected. Deterioration of underground water can be actually more serious than that of surface waters.

The following groundwater problems have been identified by the Madera County Environmental Health Department:

- DBPC Contamination - DBPC (a pesticide) contamination has been a problem in some wells through the first strata in the southwestern quadrant of the county.

- Nitrate Problems - Nitrate contamination has been found near some dairies and near the foothill regions of the county.

- Radiological Problems - Naturally occurring uranium and radon deposits are present in a band paralleling the foothills from Ahwahnee to North Fork.

- Salt Contamination (Connate Water) - Trapped marine deposits have been found in some of the hardrock wells in the eastern mountainous regions of the county.

Well Usage Within the County

Environmental Health Department data shows that during an approximate two-year period between 1991 and 1993, a total of 1,462 wells were permitted by the County. No estimates were available as to the number of wells drilled without permits.

While the quality of groundwater in Madera County is relatively good, the decreasing water table in the valley and difficulty in finding reliable sources in the mountainous area are significant concerns. While it is unlikely that groundwater resources will become totally unavailable, they may become too expensive to utilize. This may vary depending upon climatological changes such as drought and surplus water years over extended periods.

4.3 WASTEWATER

This section describes the existing on-site and public systems for collecting and treating wastewater in Madera County.

ON-SITE SEWAGE DISPOSAL SYSTEMS

On-site sewage systems in Madera County generally serve rural and other low-density areas. Due to concerns over potential impacts to public health and safety, as well as environmental concerns, the placement and design of on-site sewage disposal systems are closely regulated by the County.

General Requirements

Private aerobic or septic disposal systems are allowed in all parts of the county, with the exception of Yosemite Lakes Park, in which only aerobic systems are allowed. The design and sizing of all systems must be approved by the County Environmental Health Department.

Permitting of all septic systems in eastern Madera County requires an on-site meeting with a member of the Environmental Health Department. At that time, it is determined what type of system is required, location, and proximity to water wells, property lines, and other factors. If a system cannot meet installation criteria, a specially designed system may be required.

Special Design

Special design sewage disposal systems are required where conditions of soil, topography, or space exclude the installation of a standard septic or aerobic disposal system.

Special design disposal systems are required on all commercial applications (e.g., stores, apartments). Special design systems must be prepared by a registered civil engineer acceptable to the Environmental Health Department.

Location

Due to their potential impacts, sewage disposal systems are prohibited in the following areas:

- Any area within any easement that is dedicated for surface or subsurface improvement
- Any area not owned or controlled by the system owner unless that area is dedicated for waste disposal purposes
- Any area occupied or to be occupied by structures
- Any paved area
- Any area in which the percolation rate is slower than 30 minutes per inch for seepage pits, or faster than five minutes per inch unless it can be shown that a sufficient depth of soil is available to assure proper filtration
- Any area in which the permeable soil depth below the bottom of the leach field is less than five feet, or less than five feet below the bottom of a seepage pit
- Any area in which the ground slope is greater than 30 percent.

All septic tanks, sewer lines, leach fields, and seepage pits shall be located according to these requirements.

Capacity

The minimum area of the disposal field or seepage pit is determined by the County Environmental Health Department based on the percolation rate of the soil. Percolation test procedures are performed as set forth in the manual of Septic Tank Practice, U.S. Public Health Service, or as approved by the Administrative Authority. Percolation tests are performed at various depths to determine the best soil for sewage disposal without polluting the groundwater or otherwise causing a nuisance.

The minimum liquid capacity of septic tanks is 1,500 gallons for all dwellings up to and including four bedrooms. Tank size increases at a rate of 150 gallons per bedroom for dwellings with more than four bedrooms.

All septic tanks not currently approved by the Environmental Health Department are subject to the review of the Environmental Health Specialist. Concrete block tanks are acceptable if reinforced with #4 bars 24 inches on center each way and with all cells filled with pea gravel grout. Fiber glass tanks may be approved subject to structural adequacy. Wooden and steel septic tanks are prohibited.

The minimum diameter of the waste line serving the tank is four inches. The minimum waste line distance from the foundation of the house to the tank is five feet.

Disposal Fields

Disposal fields must conform to the following requirements:

- Leach lines shall be laid in clean stone or gravel filled trenches between 18 to 36 inches in width. The gravel or stone shall be covered with a porous type paper or straw to prevent earth backfill from filling the voids, but allowing movement of moisture upwards.
- Where leaching beds are used in lieu of trenches, the bed area shall be 50 percent greater than for trenches.
- The bottoms of all leach beds and trenches shall be level. Perforated pipe shall be laid level and capped at the end of the line.
- All leach lines are to be four inches in diameter and of a material with a 2,500 pound minimum crush capacity.
- All leach lines are to have a four inch diameter observation piping installed at the end of each leach line as per detailed on the typical installation drawing included.
- Disposal fields are not allowed over hardpan.
- All leach fields are to have a minimum of one foot dirt cover.
- Maximum fall of leach line is three inches per 100 feet.
- All leach fields shall consist of two leach lines and are to be connected by a distribution system (i.e., D-valve, RV valves). This will allow for alternating use of 50 feet of the leach field. Environmental Health suggests changing the leach field in use every year).
- All leach line walls are to be scarified with rake or other shaped object to improve effluent percolation into soil.
- All pipings including fittings shall be of PVC materials or equivalent. Styrene is prohibited.

Seepage Pits

Seepage pits must conform to the following requirements:

- Seepage pits are mandatory in hardpan areas, optional in other valley areas but not allowed in mountain areas. Pits must clear groundwater by not less than five feet and more if the soil does not allow adequate filtration. Pits shall not be more than 50 feet in depth.
- The lining in every seepage pit shall be laid on a firm foundation. The lining brick shall be placed tightly together and laid with joints staggered.

In summary, most rural areas in the county possess adequate parcel sizes, soil types, and geological features. to support on-site sewage disposal practices. The County Environmental Health Department has maintained control over the placement and design of systems in areas where public health, safety, or environmental damage is a concern. As long as this control is maintained, on-site sewage disposal should remain a viable alternative for future rural, low-density development.

PUBLIC WASTEWATER SYSTEMS

The County currently operates and maintains 14 major public wastewater systems. These systems, which are administered through County Maintenance Districts or Service Areas, use several processing methods in their treatment of wastewater. The major process types are activated sludge, community septic tank, stabilization pond, and aerated lagoon treatment systems. Table 4-2 indicates the systems currently employed in the county to manage wastewater.

The existing systems are expected to handle currently planned growth with a few exceptions. A project that will double the capacity of wastewater system serving the Sumner Hill Subdivision (Service Area #2) is currently underway. The project is in the design phase and expansion is to be complete by 1994. In addition, a feasibility study is currently in progress to determine the possibility of expanding the Oakhurst Wastewater system up to 500,000 gallons per day (GPD).

TABLE 4-2

MADERA COUNTY WASTEWATER FACILITIES

Number	Name of District	Process Type	Gallons Per Day (GPD) Capacity	System Deficiencies
MD 6	Lakeshore Park	Extended Aeration	32,000	
MD 7	Marina View	Extended Aeration	30,000	Plant will need upgrade for suture service.
MD 8	North Fork	Extended Aeration	57,000	
MD 19	Parkwood	Extended Aeration	90,000	Minimal operation problems.
MD 22	Oakhurst	Activated Sludge	250,000	Moderate problems due to capacity. Planned improvements will expand the system to double capacity.
MD 24	Teaford Meadows	Extended Aeration	23,000	
MD 28	Ripperdan	Extended Aeration & Seepage	7,500	
MD 36	Eastin Arcola	Individual Septic Collection	N/A	
MD 37	La Vina	Community Septic & Leach Field	19,000	
SA 2	Bass Lake	Activated Sludge & Hold Pond	500,000	Minor problems with the system due to area's high summer and low winter usage. Odor problems have also caused some complaints.
SA 3	Parksdale	City Treatment Plant	(max) 540,000	
SA 14	Chukchansi	Four Pond Sewage Lagoon	8,000	
SA 16	Sumner Hill	Community Septic & Leach Field	9,600	

MD = Maintenance District
SA = Service Area

Source: Madera County Engineering Department, 1993

NON-COMMUNITY WASTEWATER SYSTEMS

Areas in the unincorporated area of the county which are not served by community wastewater systems are generally served by individual private septic systems described in the last section. As a general rule, these systems operate as gravity collection systems. There are, however, a number of small private wastewater systems that serve such facilities as recreational camps.

PROPOSED AND PLANNED EXPANSIONS

Improvements to existing systems can be based on needs such as improvement of effluent quality from the treatment plant, increasing treatment plant capacity to accommodate community changes and growth, reducing infiltration/inflow (I&I) contribution to collection systems, changes or improvements to disposal systems, and responding to changes in receiving water quality goals or basin planning guidelines. The need for new and expanded treatment facilities is, however, most dependent on the specific growth and development occurring in an area.

New subdivisions that are not served by existing wastewater systems and cannot be served feasibly by individual septic tanks must submit a wastewater disposal report to the State Regional Water Quality Control Board (SRWQCB). The Board will then issue a wastewater system permit to the development, assuming the system's design is found satisfactory. If more than 100 individual septic systems are to be used, a wastewater disposal report must also be reviewed by the Regional Water Quality Control Board (RWQCB).

4.4 DRAINAGE AND FLOOD CONTROL

This section focuses on the valley portion of Madera County, where most drainage problems exist. Eastern Madera County consists primarily of foothills and mountainous areas with elevations reaching over 11,000 feet, and development is usually concentrated in historical areas along moderately- to well-defined stream and drainage channels. Drainage issues in the eastern part of the county are, therefore, generally not significant, and as such are not a focus of this report. Most drainage problems occur either near, or west, of the foothill areas, below an elevation of 400 feet mean sea level.

TOPOGRAPHY AND GEOGRAPHY

The western valley topography is mainly flat, with minimal rolling terrain near the base of the foothills and in areas which have not been leveled for agricultural purposes. Drainage within Madera County basically flows southwesterly from the Sierra Nevada Mountain range and foothill areas toward the San Joaquin River to the west. Ultimately, either by overland flow, tributary swells, or seasonal creeks and rivers such as Cottonwood and Dry Creeks, Berenda and Ash Sloughs, and the Fresno and Chowchilla Rivers, all surface drainage ends up in the San Joaquin River.

Surface conditions in Western Madera County consist primarily of irrigated agricultural land and non-irrigated pasture. Madera and Chowchilla are the major urban areas in the valley, with many smaller communities such as Madera Ranchos, Ripperdan, Fairmead, East Firebaugh, and Dairyland.

Soils in Western Madera County are comprised primarily of alluvium, flood basin deposits, and alluvial fan deposits. The low lying alluvium deposits consist of sand, gravel, silts, hardpan, and clay deposits. Alluvium soils located near the San Joaquin, Fresno, and Chowchilla Rivers provide for the highest infiltration rates of storm water due to the presence of more permeable materials.

The fertile soils found in Madera County are generally sandy loams composed of fine grained alluvial deposits consisting principally of sandy silts, sand, silt, and clay. Alluvial fan deposits consist of mixed sediments deposited by streams. Infiltration rates are locally variable and have a broad range of permeability.

MAJOR DRAINAGE BASINS

Drainage in Madera County can be separated into two sub-basins having a number of tributary basins, and one major collector. Runoff that does not pond in low-lying flat areas ultimately ends up in the San Joaquin River via the Fresno or Chowchilla Rivers. The Fresno River Drainage Basin drains approximately one-half of Madera County. The Chowchilla River drainage includes the extreme northwest portion of Madera County. Cottonwood Creek drains approximately one-quarter of the southern portion of Madera County.

Unlike the eastern portion of the county, western Madera County contains several seven natural channels for drainage. They are: Berenda and Ash Sloughs; Berenda, Cottonwood, and Dry Creeks; and the Chowchilla and the Fresno Rivers, all of which are major tributaries feeding the San Joaquin River.

PRECIPITATION

A wide range of precipitation has been recorded throughout the county. Precipitation ranges from less than six inches annual rainfall in the western valley area to well over 50 inches in the eastern Sierra Nevada mountains. There is a limited oceanic effect on precipitation between the low elevation valley areas and the eastern mountain areas. A considerable portion of winter precipitation falls as rain below the 4,000 foot elevation, while above 4,000 feet, winter precipitation occurs primarily as snow.

IDENTIFIED DRAINAGE AND FLOODING PROBLEM AREAS

The most recognized flooding problems in Madera County are identified by the Flood Rate Insurance Maps, which show significant flooding along the creeks and rivers of western Madera County; this is discussed in Chapter 7, *Safety*. The intent of this section is to identify additional, more localized (and more manageable) flooding and drainage problems within the county.

Various drainage studies have been performed within the last 20 years to analyze flooding problems in Madera County to plan for future drainage needs. The smaller areas not designated within the study areas are more localized drainage areas identified by County staff as having potential flooding problems or "standing nuisance water" problems.

The city of Madera, which is the largest developed area in Madera County, has conducted numerous studies pertaining to drainage issues. The construction of Hidden Dam on the Fresno River provided protection to the city from flooding. As with any developed area, the increase in runoff due to increased impervious surface area is an issue.

The only area in the eastern county showing significant drainage problems is the Oakhurst area.

Most of the drainage problems in Madera County are the result of past agricultural practices where creeks and drainage channels have been rerouted and channelized, thereby diminishing their carrying capacity. It is highly unlikely that these creeks will ever be returned to their original condition.

While detailed information on problem areas in the incorporated areas of the county is available, information on the severity of drainage problems in the unincorporated areas is limited to the Madera Ranchos and the Schmidt Creek areas. The Flood Insurance Rate Maps for the county are of some help, although a large portion of western Madera County is located within an "un-numbered A Zone."

Historical and empirical information from personal observations during storm events by staff of the County Engineering and Road Departments is generally the best available information. Information on known flooding problems and planned drainage improvements are also identified on a limited basis by past studies. The most recent study is the *Master Drainage Plan for Madera Ranchos, Bonadelle Ranchos, and Root Creek.* This study identifies specific drainage problems and issues, the source of flooding, current status of identified drainage problems (such as undersized culverts), and proposed improvements to minimize flooding impacts.

The County does not currently levy countywide drainage impact fees, and none are currently proposed. Funding for improvements and maintenance programs comes from augmentation funds from the County's General Fund. There is an established maintenance program wherein agreements with local irrigation districts provide for the routine channel clearing of the major creeks in the western part of the county. In addition the Madera County Flood Control and Water Conservation Agency is responsible for maintaining approximately 40 miles of project levees used for flood control purposes. The County's drainage and flood control program does not, however, include a system for prioritizing drainage maintenance or new construction projects.

4.5 SOLID WASTE MANAGEMENT

There are several sources of solid waste in Madera County; the most prominent are residential, commercial, industrial, construction/demolition, and self haul. Together, these, along with other minor sources, amount to an average of 42,102 tons of solid waste annually, or 70,170 cubic yards of landfill capacity.

Most of the solid waste destined for disposal is collected by franchised haulers. Two franchise haulers currently serve the county: EMADCO, which serves eastern Madera County, and Madera Disposal, which serves the valley area. These haulers collect residential, commercial, industrial, and other types of waste. Based on projected needs, it is not anticipated that additional franchises will be required. All of the waste collected by these haulers is disposed at the County-owned Fairmead landfill.

LAND DISPOSAL SITES

All solid waste generated in the unincorporated area is currently disposed of at the Fairmead landfill, which is owned by the County and operated by Madera Disposal Systems, Inc. The facility is located on 48 acres at the southeast corner of Road 19 and Avenue 22.

As the only landfill in Madera County, Fairmead is expected to receive 50 percent of the total waste stream. The balance is diverted through recycling and other waste diversion tactics. The total volumetric capacity of the existing site is 3,700,000 cubic yards, and the site is approaching that capacity. An approximately 7-million cubic yard expansion is currently in progress. At projected rates, the expanded landfill will reach capacity in 2020. If additional wastes can be diverted, the life of the expansion area could be increased.

Two transfer stations are also used in solid waste disposal. The transfer station in North Fork allows residents to bring garbage in by self-haul; this garbage is then retrieved by Madera Disposal. The transfer station in Oakhurst is a private transfer station utilized by EMADCO and does not allow self-haul deposits.

Leachate Control

There is no leachate collection and return system (LCRS) at the Fairmead landfill. The existing landfill is over forty years old and was never required to have a leachate control system. An LCRS will be installed

in the landfill expansion and will allow regular inspection and monitoring of leachate and other potential contaminants.

Leachate collected will be disposed of on site through application to service roads for dust control. It is anticipated that any collected leachate will be diluted with clear water at a ratio of 1:100 to prevent contamination of the surrounding areas.

WASTE DIVERSION

California Assembly Bill 939 (AB 939) established the requirement for every jurisdiction in the state to develop comprehensive plans for the reduction of solid waste. These plans are required to outline programs and policies to reduce, recycle, or otherwise divert from landfill disposal a minimum of 25 percent of each jurisdiction's solid waste stream by 1995 and 50 percent by the year 2000.

Solid waste diversion refers to the amount of material that is diverted from landfill disposal via source reduction programs, recycling, and composting. Only those materials normally disposed of at permitted solid waste landfills are included in solid waste diversion estimates. Approximately 54 percent of the solid waste stream was diverted in 1990 using waste diversion tactics. A large part of this diversion was achieved through the recycling of road pavement material, rather than standard residential and commercial wastes. The primary diversion tactics are described below.

Source Reduction

Source reduction refers to any action that causes a net reduction in the generation of solid wastes. While source reduction is occurring in a variety of forms in Madera County, measuring the reduction has been infeasible because the information necessary to quantify the activities is not available.

Residential Recycling

Several types of recycling programs may be employed as waste diversion practices. These include drop-off and buy-back centers, city/county sponsored source reduction programs, and programs run by private organizations. Based on a survey of recyclers, an estimated 956 tons of solid wastes were diverted in the County in 1990 through residential recycling programs (not including oil).

Non-Residential Recycling

Incinerator ash recycling and roadway pavement recycling account for virtually all of the unincorporated county's non-residential diversion.

Composting

Composting has not historically been a major diversion activity in the unincorporated county. A growing number of applications for biomass and composting operations have, however, been brought before the Madera County Planning Commission. The effect of biomass and composting operations on the diversion rate has not yet been measured.

SUMMARY

In summary, the overall conditions of the solid waste facilities in Madera County should be considered adequate. The expansion at the Fairmead landfill will meet expected needs until at least 2020. Solid waste diversion efforts should continue to be made in order to meet the mandates of AB 939. Programs should include community education and a focus on recycling materials other than road pavement. If these programs are successful, the life of the Fairmead landfill could be extended. Because there is only one landfill in Madera County, potential landfill sites should be identified to ensure that future growth will not be hampered by solid waste disposal limitations.

4.6 GENERAL GOVERNMENT

Madera County is a general law county created in 1893, when it formally separated from Fresno County. The County is governed by a five-member Board of Supervisors elected by district to staggered four-year terms. The Board acts as the legislative and executive body for the County. It is responsible for appointing all department directors with the following exceptions: Auditor/Controller, Assessor, Treasurer/Tax Collector, District Attorney, Judges, County Clerk, Recorder, Sheriff, and Coroner, all of whom are elected. The Board is also responsible for the annual County budget and all County levels of service.

There are two incorporated cities in Madera County: Madera and Chowchilla. These cities are governed by city councils and other necessary committees that are responsible for issues that may affect cities.

4.7 LAW ENFORCEMENT

Law enforcement in the unincorporated area of the county is provided by the County Sheriff's Department. The Sheriff's Department had a total of 56 sworn officers in 1992, 52 of which were paid from the General Fund, while the remaining 4 were paid from grants and contract accounts. There were 19 non-sworn clerical or support personnel giving the Department a total of 75 people in 1992.

The county is divided into eight beat areas, with one officer on duty per beat at any one time. The shifts are divided into three eight-hour shifts. Deputies patrol their assigned beat, responding to calls as they come in.

The most pressing problem confronting the Sheriff's Department is understaffing. In 1980, the Department had 52 sworn deputies covering a population of approximately 40,000 (in the unincorporated areas) for a ratio of 1.3 deputies per 1,000 population. In 1993 the Department had 56 officers covering a population of approximately 70,000, for a staffing ratio of 0.7 deputies per 1,000 population. According to the County Sheriff, Glen Seymour, this is an extremely low coverage rate and prevents the Department from providing an adequate level of public safety.

Law enforcement in the cities of Chowchilla and Madera is provided by each city's Police Department.

4.8 FIRE PROTECTION

The California Department of Forestry and Fire Protection (CDF) provides fire protection services to most of the County. CDF began providing this service in 1928, when they entered into a contractual fire protection agreement with the County of Madera. The City of Madera also contracts with CDF to provide fire protection services, while the City of Chowchilla has its own fire protection staff.

The current contract between the County and CDF funds 17 fire fighting personnel (CDF employees). These employees fall into the following categories: one dispatcher, one training captain, three battalion chiefs, and twelve station personnel. In addition, approximately 220 Paid-Call "volunteer" fire fighters also assist on fire protection calls when required.

The County operates and equips 16 fire stations (see Figure 4-2). Four of these stations are staffed with permanent CDF employees, while 12 are unstaffed, stand-alone stations. The four staffed stations are the following: 1) Madera Station, 2) Madera County Club Station, 3) Oakhurst Station, and 4) Bonadelle Ranchos Station. CDF has an additional five wildland fire stations in Madera County, only one of which is staffed on a year-round basis. Only one lookout station, at Deadwood Peak, is currently staffed. Because there are no budgeted positions for this purpose, the Deadwood Peak lookout is staffed on a voluntary basis only.

FIRE RATING

The Insurance Services Office (ISO) is an agency which evaluates fire protection features for all fire departments for purposes of establishing rates for insurance underwriters. ISO uses a rating system that is based on scale of one to ten, with one being the best fire protection rating and ten being the worst. In order to determine an area's rating, the ISO uses a formula where the primary factors are the availability of both water and fire protection service in the area.

ISO ratings in Madera County vary from a 6 in areas with a rated hydrant system, to a 9 in some of the more remote areas. Most of the mountain area is rated 8, due to CDF's ability to deliver water via water tenders. Specific fire hazard information and insurance classifications are described and mapped in Chapter 7, *Safety*.

IMPACT OF DEVELOPMENT

New development in Madera County places an additional burden on the CDF to provide adequate fire protection service. In order to help provide this service, the County collects developer impact fees for fire protection. As of July 1993, these fees were collected as follows:

Single Family Residence	$330.00 per dwelling unit
Multiple Family Residence	294.00 per dwelling unit
Office & High number of Employees	.44 per square foot
Retail & Medium number of Employees	.27 per square foot
Industrial & low number of Employees	.19 per square foot

These fees, however, do not provide enough funds to build new fire stations and provide immediate service to new growth areas. As a result, some new developments are being required to provide the money, and or facilities, necessary to bring fire protection service to their developments. In return, these developments may be reimbursed by future developments that come into the area and utilize these facilities.

4.9 UTILITY SERVICE COMPANIES

PACIFIC GAS & ELECTRIC

PG&E provides electrical service to all developed areas of Madera County, and natural gas to the valley area except the southeastern part of the county.

Most electrical service in Madera County is provided by above ground lines. New residential developments with lots smaller than three acres, however, are required to have service provided by underground lines. Transmission lines enter the county from the north, south, and east, with the major substations being outside the county.

The major concern confronting PG&E is the lack of natural gas service in the southeastern part of the County. With that exception, PG&E is able to provide service at an adequate level and expects to maintain that level of service even with growth continuing at the same rate.

TELEPHONE SERVICE

Madera County is served by three telephone companies; Pacific Bell, Sierra Telephone, and Ponderosa Telephone.

Pacific Bell

Pacific Bell provides service to the western part of the county, from Hensley Lake west to the Fresno/Madera county line. Service is currently provided through a combination of above-ground cables and below-ground conduits. However, undergrounding of all lines is occurring in all new developments in accordance with State law.

Sierra Telephone

Sierra Telephone is the county's largest service provider by area. Their service encompasses the areas of Ahwahnee, Bass Lake, Coarsegold, Oakhurst, Raymond, Sugar Pine, and Yosemite Lakes Park, along with all points within that area. Approximately 95 percent of the service is provided through underground lines.

Ponderosa Telephone

Ponderosa Telephone is the smallest of the service providers by area. Ponderosa Telephone serves the O'Neals and North Fork region along with the entrance area to Yosemite Lakes Park. Most service is provided via underground lines.

On the whole, all companies are currently meeting service demands and all expect to continue providing the same level of service with no foreseeable problems.

CABLE TELEVISION

Madera County is served by two cable television companies. Continental Cablevision covers western Madera County, including the city of Madera. Northland Cable covers the city of Chowchilla, Ahwahnee, Bass Lake, Coarsegold, and Oakhurst. No cable service is provided to Raymond or any extreme outlying areas. Both companies mainly provide service using above-ground lines.

Continental Cablevision expects to continue to meet current and future service demands. Northland Cable is also currently meeting service demands. Due to the high rate of growth in the county over the last several years, and the expected continuance of such growth, Northland Cable has, however, expressed concern about its ability to meet future demand. Northland is therefore upgrading its facilities in order to account for increased growth that is expected in its service area.

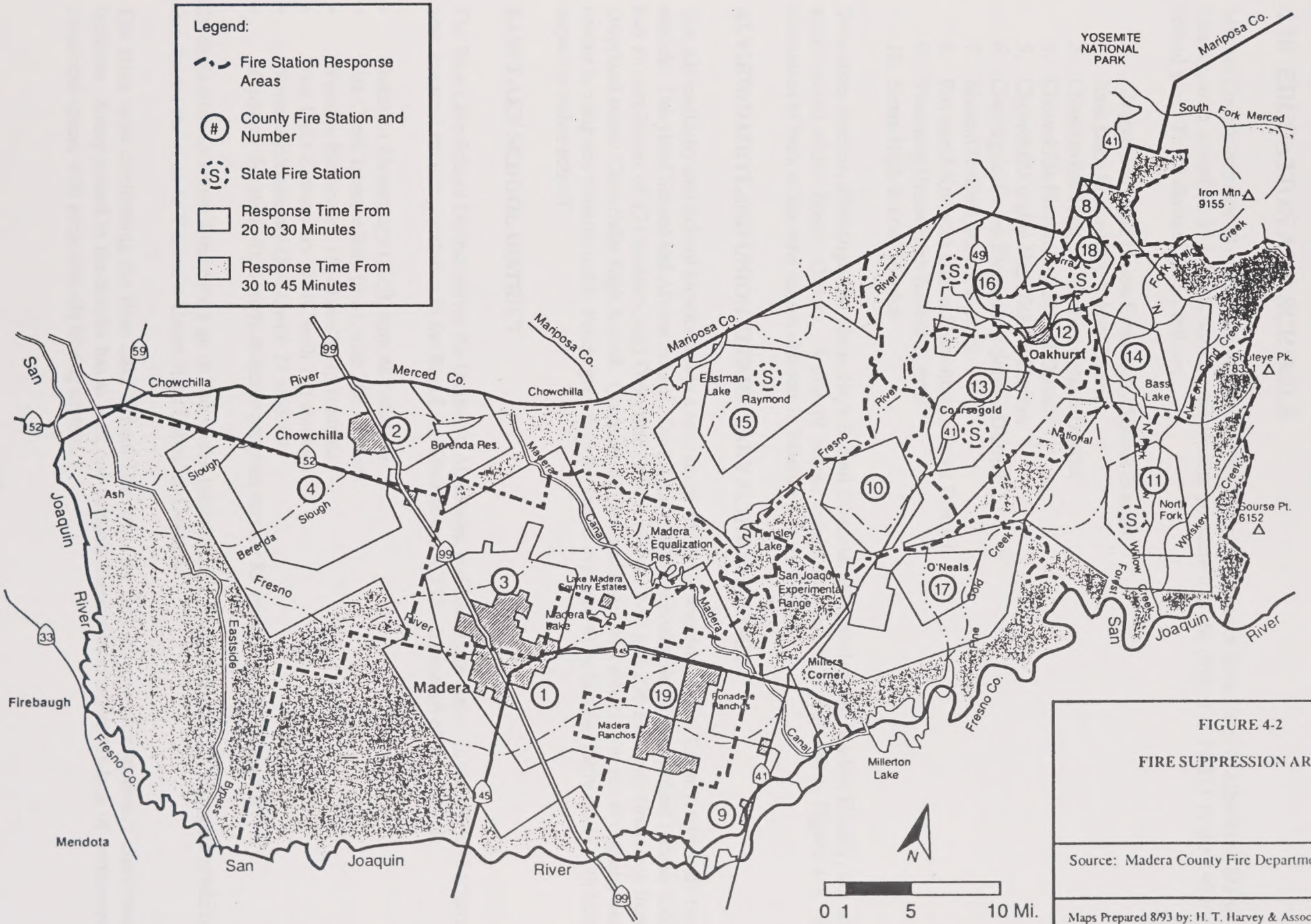

FIGURE 4-2

FIRE SUPPRESSION AREAS

Source: Madera County Fire Department, 1992

Maps Prepared 8/93 by: H. T. Harvey & Associates

4.10 EDUCATION AND SCHOOLS

Madera County includes all or portions of eleven school districts. Nine of districts have schools in Madera County, with a total of 37 schools with a total student population in the district is 21,571 in the 1992/93 school year. These districts are as follows:

1. Alview/Dairyland Union Elementary School District
2. Bass Lake Elementary School District
3. Chawanakee Joint Elementary School District
4. Chowchilla Elementary School District
5. Chowchilla Union High School District
6. Coarsegold Union Elementary School District
7. Madera Unified School District
8. Raymond-Knowles Union Elementary School District
9. Yosemite Union High School District
10. Sierra High School District

Two other districts, Firebaugh and Sierra High School Districts, also overlap into Madera County, but are administered within Fresno County. A map of school district boundaries is provided in Figure 4-3. A discussion of each of the nine school districts in Madera County follows.

ALVIEW/DAIRYLAND UNION ELEMENTARY SCHOOL DISTRICT

The Alview/Dairyland School District serves a very small portion of western Madera County, with only two schools: Dairyland School and Alview School. During the 1992/93 school year, Alview School (grades K-2) had an enrollment of 124 students, and Dairyland School (grades 3-8) had 238 students. Graduates from Dairyland attend Chowchilla High School. Currently Alview and Dairyland schools are not at capacity and neither is using any portable units. Future growth in the area is expected to be handled fairly easily with little impact to either school.

BASS LAKE SCHOOL DISTRICT

The Bass Lake School District serves the Oakhurst, Ahwahnee, and Bass Lake areas. In the 1992/93 school year, the total student population in the Bass Lake District was 1,332. It consists of six schools:

- Oakhurst Elementary (K-5), with 487 students
- Oak Creek Intermediate (6-8), with 308 students
- Wasuma Elementary (K-8), with 315 students
- Bass Lake Elementary (K-8), with 116 students
- Wawona Elementary (K-6), with 21 students
- Mountain Home (K-8), a study-at-home program serving 85 students in outlying areas.

Students from Oakhurst Elementary go to Oak Creek Intermediate. Students finishing the eighth grade in this district move on to Yosemite Union High School in Oakhurst.

The main issue confronting the Bass Lake School District is the lack of space for necessary classroom facilities. Every school in the district has at least one portable classroom to offset the lack of permanent classroom space, with some schools having several.

CHAWANAKEE JOINT SCHOOL DISTRICT

Chawanakee Joint School District serves the southeastern part of the county from North Fork through the O'Neals area and Madera Ranchos on the valley floor. In the 1992/93 school year, the district had a total student population of 966 spread over four schools:

- North Fork School (K-8), with 450 students
- Spring Valley Elementary (K-8), with 225 students
- Sierra View Elementary (K-6), with 275 students
- Chawanakee School (K-8), with 16 students.

Sierra View graduates attend junior high at Spring Valley, while all eighth grade graduates attend Sierra High School in Tollhouse (Fresno County).

Issues and concerns for the Chawanakee Joint School District include overcrowding at Sierra View and Spring Valley schools, which the District believes will lead to the use of portable classrooms in the near future. State budget cuts also forced the closure (for one year at least) of the Chawanakee School due to lack of funding; students are bussed to North Fork School. All schools in the District still operate on the traditional nine-month schedule.

CHOWCHILLA ELEMENTARY SCHOOL DISTRICT

The Chowchilla Elementary School District serves the northwestern portion of the county along Highway 99 from approximately Fairmead north to the Madera/Merced County line. In the 1992/93 school year, the district had four schools with a total student population of 1,564.

- Stephens School (K) with 176 students
- Fuller School (1-3) with 576 students
- Fairmead School (4-5) with 325 students
- Wilson School (6-8) with 487 students.

Students graduating from Wilson School go on to Chowchilla High School.

One of the primary concerns of the Chowchilla Elementary School District is the lack of adequate classroom space. All of the schools in the district use portable classrooms. Other concerns in the district include financing of new school facilities needed from the high growth rate within the district.

CHOWCHILLA UNION HIGH SCHOOL DISTRICT

Chowchilla Union High School is one of four high schools that serve the Valley floor in Madera County. The extreme southwestern part of the county is in the Firebaugh Union High School District, which is located in Fresno County. The central area of the valley floor (the area around Highway 99) near the city of Madera, is served by Madera Unified School District's two high schools. The northwestern portion of the county from approximately Berenda north to the Madera/Merced County line and west to the Fresno/Madera County line falls within the Chowchilla Union High School District. The district consists of one high school and had 622 students in the 1992/93 school year.

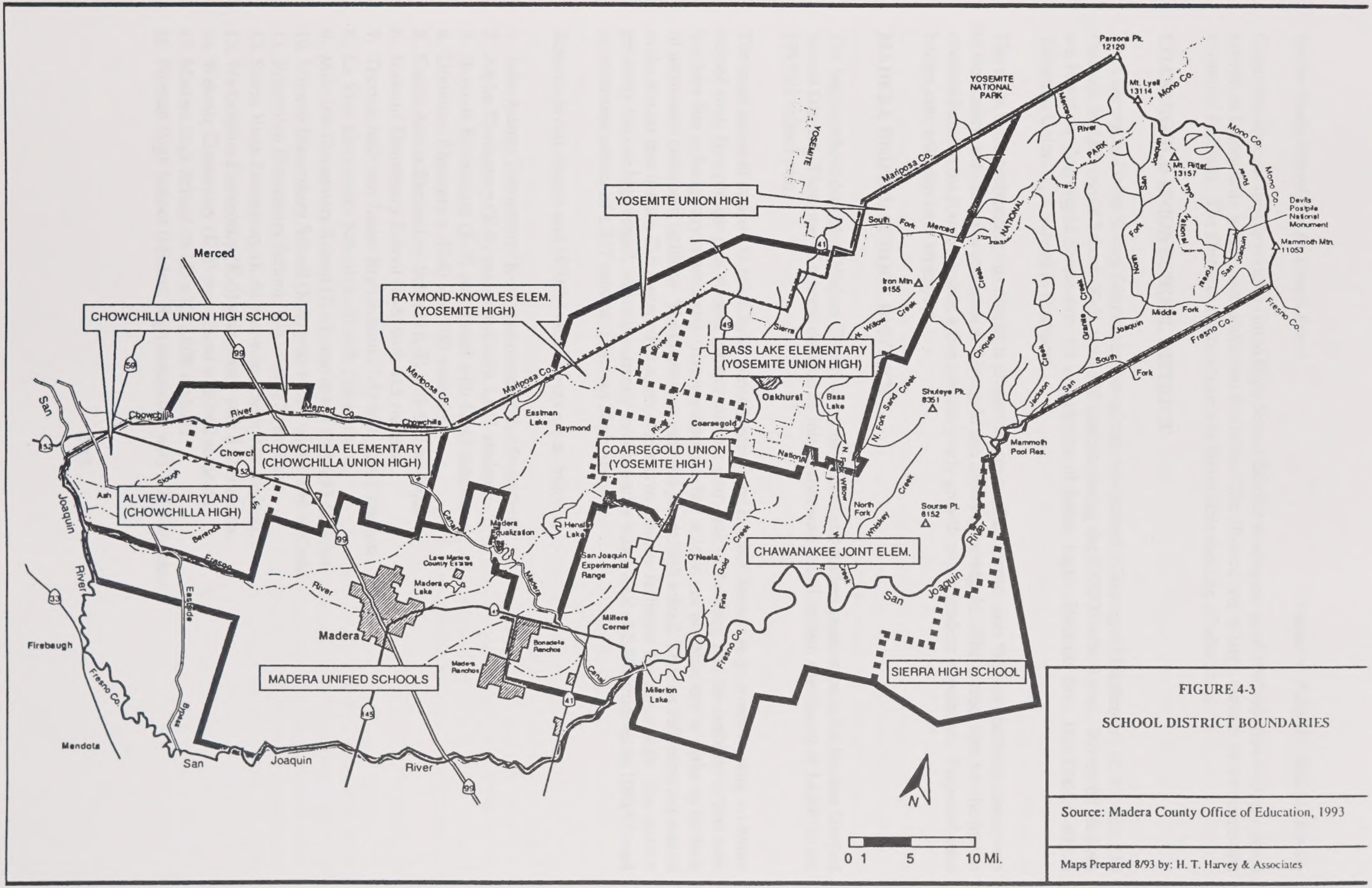

FIGURE 4-3

SCHOOL DISTRICT BOUNDARIES

Source: Madera County Office of Education, 1993

Maps Prepared 8/93 by: H. T. Harvey & Associates

Classroom space in the Chowchilla Union High School District is adequate as of 1992/93, however, projected growth in Chowchilla will require additional facilities. The 50-acre site is large enough to accommodate expanded facilities. The District's major concern is future state funding of education.

COARSEGOLD UNION SCHOOL DISTRICT

The Coarsegold Union School District consists of only two schools: Coarsegold Elementary (K-8), with 530 students, and Rivergold School (K-6), with 338 students during the 1992/93 school year. Rivergold students are bused to Coarsegold Elementary for completion of junior high. Students from this District attend Yosemite Union High School in Oakhurst.

The main issue confronting this district is classroom space. The district uses the most portable classrooms in the county, with seven in operation at Rivergold and three at Coarsegold. The district also has the lowest revenue limits in the county, despite a five percent yearly growth rate in student population. Projected state budget cuts will also have an impact.

MADERA UNIFIED SCHOOL DISTRICT

The largest school district in Madera County in terms of area and student population is the Madera Unified School District. There are 16 schools covered by this district with a total student enrollment of 14,890 in the 1992/93 school year.

The main issues of concern to this district mirror issues faced in other districts (e.g., overcrowding, no future school sites, five percent plus student growth rate per year, lack of funding, and the inability to hire new teachers due to budgetary constraints). Every school site has at least one portable unit to make up for lack of permanent classroom facilities. The district has only one junior high school, Thomas Jefferson; any school in the district that is not a K-8 designation sends students to Thomas Jefferson for junior high. The district presently has one high school, which is currently over capacity with a total of 2,808 students in 1992/93, and an extension school of 1,217 students (Furman High School).

Schools in this district and 1992/93 enrollments are as follows;

1. John Adams Elementary (K-6) year-round with 854 students.
2. Alpha Elementary (K-6) year-round with 1,011 students.
3. Berenda Elementary (K-8) year-round with 1,045 students.
4. Dixieland Elementary (K-8) with 387 students.
5. Eastin Arcola Elementary School (K-8) with 651 students.
6. Howard Elementary School (K-8) with 415 students.
7. Thomas Jefferson Junior High School (7-8) with 1,165 students.
8. La Vina Elementary School (K-8) with 326 students.
9. Millview Elementary School (K-6) year-round with 893 students.
10. Monroe Elementary School (K-6) year-round with 1,104 students.
11. Ripperdan Elementary School (K-8) with 270 students.
12. Sierra Vista Elementary (K-6) year-round with 970 students.
13. Washington Elementary (K-6) year-round with 812 students.
14. Webster Elementary (K-8) year-round with 962 students.
15. Madera High School (9-12) with 2,808 students.
16. Furman High School (Madera High extension) with 1,217 students.

In addition to the schools listed above, Lincoln Elementary School is scheduled to open in 1993/94 in the city of Madera near the intersection of Sunset and Granada Avenues. A new junior high is also planned for Madera Unified in the eastern part of the city of Madera.

RAYMOND-KNOWLES UNION ELEMENTARY SCHOOL DISTRICT

The Raymond-Knowles Elementary School (K-8), with 97 students in 1992/93, is a "feeder" school that buses students to Yosemite Union High upon graduation. The district consists of only the one school serving the rural communities of Raymond and Knowles. Low rates of population growth in these areas have maintained adequate classroom space. The District expects to maintain enrollment near its current levels for some time to come.

YOSEMITE UNION HIGH SCHOOL DISTRICT

Yosemite Union High School, in Oakhurst, is the only Madera County high school serving the mountain areas. Although some students from the Chawanakee District attend Sierra High School in Tollhouse, that school is located in Fresno County. Yosemite High School draws students from Ahwahnee, Raymond, Coarsegold, Oakhurst, and other outlying areas. The 1992/93 student enrollment was 870, above the school's design capacity. The main issues confronting the school are overcrowding, need for teachers, maintenance, and funding.

SIERRA JOINT UNION HIGH SCHOOL DISTRICT

The Sierra Joint Union High School is part of a joint district that encompasses portions of both Madera and Fresno Counties. The District serves the Madera Ranchos and North Fork areas of Madera County. The total student population in the District is 1,002 (February 1994), and consists of two schools:

- Sierra Joint Union High School (9-12), with 950 students; and
- Willow Creek Alternative Education (9-12), with 52 students.

The primary issue confronting this District is growth, although not with respect to overcrowding, as in other districts in the county. Instead, the District is concerned with the distance that students in Madera County must travel to attend Sierra Joint Union High School, which is in the Fresno County community of Tollhouse. As Madera County experiences population growth, the issue of distance becomes a greater conern in this District. As of February 1994, the District is considering the possibility of a new facility, and looking at financing options and siting alternatives.

SCHOOL FINANCING

School financing in California is funded through a combination of state and local sources. Recent court decisions, amendments to state law, and pending initiatives have created significant confusion over alternatives for future school financing. Within the past five years, school facilities finance issues have moved to the forefront of local government planning in California. The importance of these issues has grown as school enrollment has increased, while the sources of funding to finance facilities development have decreased.

Regulatory Environment

The State of California has historically been the primary source of funding for new school facilities in the state. This responsibility has been administered largely through the provisions of the Leroy F. Greene State School Building Lease-Purchase Law of 1976, which set up a framework for the allocation of statewide bond proceeds sales to local school districts for the construction of school facilities. Since 1976, 12 statewide bond measures for funding the construction or modernization of K-12 school facilities have been brought to the California electorate, all of which have been approved. The waiting list for state funding, however, exceeds the funding available through approved state bonds. State funds are tied to certain criteria, including student-teacher ratios, consideration of year-round schools, and matching local funds.

To supplement the Greene Lease-Purchase Law of 1976, the State Legislature passed the School Facilities Law of 1986, which authorized school districts to impose development impact fees for the purpose of new facility construction. This law authorized districts to assess a fee of $1.50 per square foot of residential building space and $0.25 per square foot of commercial or industrial building space, with provisions for inflation adjustments every two years starting in 1990. (With these inflationary adjustments the authorized fees as of 1993 were $1.65 per square foot for residential development and $0.28 per square foot of commercial and industrial development.) The law prohibited the legislative bodies of local agencies from levying development fees or other requirements for the construction or reconstruction of schools, other than pursuant to designated statutory authority. The maximum allowable assessment, however, generally covers less than a third of the costs associated with new school development.

School districts throughout California have recently begun asking cities and counties to play an active role in ensuring adequate financing for local school facilities as a condition of granting development approvals. This has been the result of three things: (1) questions about the adequacy and reliability of state grants for school construction; (2) limits imposed by state law on the ability of school districts to directly impose development impact fees; and (3) recent California court decisions that appear to uphold the authority of cities and counties to impose school financing requirements as a condition of granting certain kinds of development approvals. The third has been the source of significant concern and controversy over the past few years, as school districts have attempted to enlist the support of cities and counties in conditioning certain development approvals on the adequacy of school facilities. This practice has been challenged by some development interests as exceeding the authority of local agencies. Since 1988, however, three appellate court decisions have interpreted local authority as extending to consideration of the availability of school facilities when making certain kinds of "legislative" land use decisions (e.g., general plan amendments and zoning changes). These three decisions are *Mira Development Corp.* v. *City of San Diego* (1988), *William S. Hart Union High School District* v. *Regional Planning Commission of the County of Los Angeles* (1991), and *Murrieta Valley Unified School District* v. *County of Riverside* (1991).

In November 1993, the voters rejected Assembly Constitutional Amendment (ACA) 6, which would have allowed school districts to adopt general obligation measures by a simple majority vote of the local electorate, rather than the two-thirds vote now required by the California Constitution. Passage of ACA 6 would also have permanently increased the maximum developer fee by $1.00 (it was increased by $1.00 in 1993 prior to the failure of ACA 6) and prohibited local governments from denying projects based on school facilities impacts.

Local School Financing

As of 1993, all Madera County school districts levy developer impact fees, and several are in the pursuing state funds for the development of new school facilities. The Coarsegold School District also had a local school bond measure approved which provides additional ongoing local funding.

Several school districts have requested that the County require greater mitigation of school impacts on new development, since the current impact fees are not adequate to address school funding. The extent to which local governments can require additional school financing is uncertain, as described above.

4.11 LIBRARIES

The Madera County Library system consists of five branch libraries. The main library is located in the City of Madera, while four satellite branches are located in North Fork, Madera Ranchos, Oakhurst, and Chowchilla.

Total library staff consists of 12 persons for all five branches. An organization called Friends of the Library has 62 volunteer members who donate their time to offset the understaffing.

The Madera County Library system has 61,240 holdings countywide. However, the Madera County Library is a member library in a five-county network which makes a substantially larger number of holdings available to Madera County residents as books may be obtained from other member libraries in the network.

As with many California county libraries, Madera County Library's major concern is the lack of funding. Budget cuts have forced the layoff of three positions, cutbacks in service hours and, as of the 1993-94 budget, the elimination of the book buying budget. The library also lags far behind in automation and computerized customer service. Further, with the elimination of the book budget, the library is unable to keep up with the needs of the growing Hispanic community, which relies heavily on books printed in Spanish.

The library has successfully supplemented funding to offset their loss to budget cuts. Local media has also been involved by publicizing the libraries recent monetary constraints. That publicity has resulted in a significant increase in outside donations and other successful fund raising ventures.

4.12 FINDINGS

- Ten out of the eleven major community water systems (200+ connections) serving the county have groundwater as their primary water source.
- All eleven major community water systems operate well with only minor operating deficiencies. All systems are being required to have emergency chlorination programs in place.
- Approximately 44 small water systems (systems with less than 200 connections) are utilized within the county. A majority of these systems also have groundwater as their primary water source.
- At present, adequate groundwater and surface water is available to serve the existing water systems in the county. Long term demand may require the expansion of existing systems and/or addition of new systems in order to meet needs.
- The County has become increasingly reliant on groundwater resources in recent drought years. This has led to a trend of increasing depth to groundwater.
- The mountainous portions of Eastern Madera County provide only spotty and sometimes unreliable sources of groundwater.
- While groundwater resources are generally available in the western portions of the county, as depth to groundwater increases, these resources are becoming more expensive to reach.
- Isolated pockets and bands of groundwater contamination do exist and should be avoided and/or treated when identified.
- Existing wastewater systems in the county are generally in good condition and capable of meeting service demands. In areas where anticipated demand is above capacity, plans to expand capacity are currently underway.
- Areas which are not served by public wastewater systems generally utilize on-site sewage disposal systems. The location and design of these systems are regulated by the Madera County Environmental Health Department.
- Drainage concerns are primarily concentrated in the valley portions of the county and are a result of past agricultural practices where creeks and drainage channels have been rerouted and channelized.
- A prioritization of drainage issues for both maintenance and new projects is a key element missing from the County's drainage and flood control program.
- The County currently utilizes a single landfill disposal site at Fairmead. At anticipated growth rates, this site, including expansion area, will be filled in 2020.
- Implementation of mandatory waste stream diversion to meet the State AB 939 requirements will involve source reduction and recycling efforts to reduce waste stream quantities.
- The major concern facing the Madera County Sheriff's Department is understaffing. In 1993, the staffing ratio was of 0.7 officers per 1,000 unincorporated residents.

- The County contracts with the California Department of Forestry and Fire Protection (CDF) to provide fire protection service for the County. Because of a lack of funding, equipment and manpower, CDF will face a significant challenge in attempting to serve new growth areas in the county.

- Because the developer impact fees currently being collected often do not provide sufficient funding, new developments may be required to provide fire protection equipment/facilities necessary to serve their respective developments.

- PG&E has adequate capacity to provide services at an acceptable level and expects to be able to maintain that level of service even with growth continuing at current rates. The one exception being a lack of natural gas service to the southeast part of the county.

- The three telephone service providers are currently meeting demands and expect to do so even with anticipated growth.

- Cable Television service is provided by Continental Cablevision and Northland Cable. Continental is meeting needs and is upgrading existing lines to fiber optics. Northland Cable is anticipating a major upgrade and expansion to meet future needs.

- Many of the County's school districts are facing overcrowding and space limitation problems. In schools where this is a concern, portable classrooms have been brought in.

- Funding is a major concern for all school districts in Madera County. All districts collect and rely on developer impact fees to offset a lack of state and local funding. Coarsegold School District is the only district to have a school bond measure approved.

- Due to funding problems, the Madera County library system has been forced with layoffs, cut-backs in service hours, and elimination of the book buying budget.

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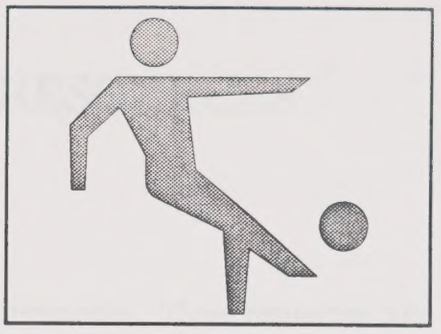
CHAPTER 5

CULTURAL AND RECREATIONAL RESOURCES



CHAPTER 5

CULTURAL AND RECREATIONAL RESOURCES

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5.1 INTRODUCTION

Madera County has a variety of cultural, archaeological, and recreational resources. These resources take several forms ranging from the contemporary cities and communities in the county and its rich open space resources to the historic settlement and development periods, to the ethnography and archaeological resources of the Native American period. This chapter summarizes the county's prehistoric, historic, and recreational resources.

The patterns of human occupation of the area now known as Madera County have left traces of their existence on the land. Preserving and interpreting these resources is important in terms of public education, as well as preserving the area's historic and prehistoric character. There are slightly more than 2,000 recorded archeological sites in the county, most of which are located in the foothills and mountains. Recorded prehistoric artifacts include village sites, camp sites, bedrock milling stations, pictographs, petroglyphs, rock rings, sacred sites, and resource gathering areas. Historic sites include homesteads and ranches, mining and logging sites and associated features (such as small camps, railroad beds, logging chutes, and trash dumps).

Most of the archeological survey work in the county has taken place in the foothills and mountains, with many taking place in the Sierra National Forest to meet the requirements for timber harvesting and salvage plans; thus, there is the large number of recorded sites in the eastern county. This does not mean, however, that no sites exist in the western county, but rather that this area has not been as thoroughly studied.

While the County has an abundance of recreational opportunities in State and federal lands, most of these area located in the eastern county and the valley portion has few recreational opportunities other than city parks and school sites. The County currently has no parks and recreation system.

5.2 PREHISTORIC RESOURCES

Prehistoric resources are those which precede written record. It is presumed that Native Americans occupied the San Joaquin Valley as early as 8,000 years ago. Indicators of Madera County's prehistoric past have been uncovered at numerous sites throughout the county; detailed archaeological studies have been performed on a site-by-site basis, often as part of the development process.

Devil's Postpile National Monument, in the Sierra National Forest, is a prehistoric resource dating back approximately one million years ago. The area consists of extraordinary lava formations created over thousands of years by the processes of volcanic eruption and glacial movement.

During the late 1800s there were two significant prehistoric archaeological finds in the region that warrant mentioning. First, in 1864, the remains of a prehistoric animal were uncovered along the banks of the Fresno River, above what is now Hidden Dam/Hensley Lake. The dissected skeletal remains of what became known as the Bailey Mastodon were placed on public display for a period of time, and ultimately disposed of in the San Joaquin River.

Second, in 1890, the remains of a petrified prehistoric man were uncovered during excavation for an irrigation dam along Cantua Creek in Fresno County. The corpse remained almost completely intact at the time; however, the preservation practices of that era unfortunately did not insure permanent preservation for scientific and educational uses of future generations.

Eastman Lake Area

One of the most intensively studied areas in the county is what is currently the Eastman Lake area along the Chowchilla River. Prior to excavation in the area, numerous habitation sites and bedrock mortars were discovered in a very concentrated area, suggesting long and/or intensive occupation of the area. Subsequent to these discoveries, several additional sites have been excavated. Three phases of Chowchilla River prehistory have been identified, based on subsistence strategies and artifact styles: the Chowchilla Phase (300 B.C.-A.D. 300), the Raymond Phase (A.D. 3400-1500). and the Madera Phase (A.D. 1500-1850) (M. Moratto).

The Chowchilla Phase appears to have been prosperous, with a few relatively large population clusters next to the Chowchilla River. Subsistence was dependent on hunting, fishing, and seed gathering activities, evidenced by findings of fish spears, projectile points, and milling stones and mortars. Artifact types and materials used reflect extensive trade with the Great Basin and Southwestern peoples.

The Raymond Phase, on the other hand, appears to have been an interval of cultural instability and change. A sharp decline in the use of ornamental objects, small and dispersed populations, lack of ornamentation in burials, heavy reliance on plant foods, no evidence of fishing, disrupted trade systems, and the commonality of violence attest to a difficult existence during this period.

In the Madera Phase, the ancestral Southern Sierra Miwok culture flourished. Ornamentation is abundant; exotic Brown Ware pottery was used; and there is evidence of a steatite (soapstone) industry featuring various cooking and hunting implements, as well as ornamental pieces. In this period, the village community settlement pattern emerges, with primary villages along the river and smaller settlements on Chowchilla River tributaries. The appearance of semisubterranean ceremonial and habitation structures circa A.D. 1550 coincides with a dramatic population growth.

The decline of this population was likely due to a massive malaria epidemic in 1833, as well as forced relocation by Spanish and European settlers.

Fairmead Landfill

In a more recent discovery (May 1993) near the Madera County community of Fairmead, approximately 2,000 bone parts from nearly a dozen species, including Columbian mammoths, were unearthed during excavation for a landfill expansion. Preliminary estimates suggest that the artifacts may be as much as 500,000 years old. The site is of great significance on a local as well as a national scale, as there are very few sites of this type and period in the western United States. The opportunity for future study of this site is currently unclear; funding issues related to continued study or possible relocation of the landfill, limit the County's ability to pursue such options.

5.3 HISTORIC RESOURCES

Public Resources Code Section 5021.1(b) defines a historic resource as "any object, building, structure, site, area or place which is historically significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California." Protection of historic resources is of value in terms of public education, maintenance of historic records, and preservation of the character of Madera County. The importance of such resources is codified in the California Environmental Quality Act (CEQA) (*Public Resources Code* Section 21000), which prohibits actions that "disrupt or adversely affect a prehistoric or historic archaeological site or a property of historical or cultural significance to a community or ethnic or social groups; or a paleontological site except as a part of a scientific study." Acceptable approaches to preservation of prehistoric and historic resources, under CEQA, include: planning development to avoid affecting sites; establishing open space/conservation easements which incorporate known sites; and capping or covering sites with soil under certain prescribed constraints.

Madera County has a rich historic past. Originally occupied by Native Americans, patterns of subsequent settlement of the county by non-native peoples has been closely linked to economic development of the county's natural resources.

HISTORIC DEVELOPMENT

The county's topography and its natural resources provided the context for its economic development and subsequent land development patterns. Major phases of the county's history include the Native American period, followed by periods which correspond to exploitation of the county's resources, including the Gold Rush, copper and granite mining, timber, agriculture, and recreation. Discussions of these phases follows.

Native Americans

The Native American groups inhabiting the San Joaquin Valley during ethnographic times were known collectively as the Yokuts. There were over 40 Yokuts tribes which, for the purposes of description have been divided into three geographical categories: the Northern Valley, Southern Valley, and the Foothill Yokuts. The Northern Valley Yokuts inhabited areas of Madera County along the San Joaquin River and its tributaries, including the Chowchilla, Fresno, and Merced Rivers, from the valley floor up to about 3,000 feet. The tribes were most likely drawn to these areas by the river and the abundant riparian and wetland resources in the vicinity.

Very little is known about the Northern Valley Yokuts, due to their rapid disappearance. Disease, missionization, and the effects of the Gold Rush on settlement of the area account for their decline. Most of what is known about the Northern Valley Yokuts is taken from settlers' and visitors' written accounts. The Yokuts were organized into tribelets of approximately 300 people, which generally built semi-permanent settlements on low mounds near waterways. Their dwellings consisted of small structures which were covered with tule stalk mats and placed on top of the mounds to avoid flooding. Much of their subsistence depended on fishing; hunting small game; and gathering and processing wild seeds, acorns, and other plants.

Higher in the Sierras, another linguistic group called the Monache inhabited what is now Madera County during approximately the same time period as the Yokuts. This group was also comprised of a number of tribal groups. The Northfork Mono lived in Madera County in what is now the North Fork/O'Neals area, along the North Fork of the San Joaquin River and its tributaries, primarily between 3,000 and 7,000 feet. The Northfork Mono often crossed the Sierra crest on trading expeditions, and moved about quite often

within their area. Their subsistence was based on hunting and gathering, and fishing, and depended upon seasonal elevational movements.

Confrontations between Native Americans and non-native explorers, trappers, and miners, combined with attempted subversions of Native American culture by non-native settlers eventually led to the Mariposa Indian War in 1850. These battles took place mainly in what is now Madera County and led to the discovery of the Yosemite Valley by Major James Savage and his troops as they pursued the tribes into the mountains. Yosemite was named after the Indians who inhabited it at that time. The Mariposa Indian War culminated in the signing of the Indian Peace Treaty in 1851, establishing two reservations, one in Madera County and the other in Fresno County. Native American population continued to decline, however. It is estimated that sixty years later, in 1910, only 6 to 9 percent of the Yokuts and Monache groups survived.

The Gold Rush

The first non-native visitors to the area which is now Madera County arrived around 1770, and in larger numbers around 1825, and consisted of soldiers, explorers, and trappers, who generally did not stay for more than a few months. The first large wave of immigrants to the area was due to the discovery of gold in California. Beginning in 1849, European and Chinese immigrants flocked to the foothills and mountainous areas of Madera County hoping to make their fortunes. The county's first settlements were inhabited by gold miners, and included such towns as Coarse Gold (Coarse Gold Gulch), Grub Gulch, Fine Gold Gulch, Millerton, and O'Neals (an important stage line crossroad). The placer (alluvial or glacial deposit containing valuable minerals) mines which supported these and other mountain communities were depleted over the next 15 years, causing the decline of many of these communities.

Copper and Granite Mining

Various types of minerals have been extracted in Madera County throughout history. The two most historically significant materials (after gold) for the county were copper and granite

Between approximately 1860 and 1900, copper mining and smeltering (the process of melting down the ore) was one of the county's primary industries. The Madera mines were part of the Capital Foothill Belt, which produced all of the copper ore in California. The first mine was established at Buchanan, approximately 15 miles north of Madera, on the Chowchilla River. The principal mine in the area was the Ne Plus Ultra Mine on the Daulton Ranch south of Buchanan.

In the late 1900s, copper production in the county declined rapidly, due to competition from other economically suitable areas, and by 1905 there was no production at all in the major mines. Small extraction operations occurred until the 1940s.

Granite extraction began in Madera County in the late 1800s, with a number of small operations in the Raymond area. The community of Raymond actually began as a tourist stop on the route to Yosemite, but with the advent of the railroad, quarry operation and transport of materials became feasible. By 1901, granite extraction replaced gold extraction as the primary mineral activity in the county; it remained such for nearly 50 years. The greatest surge in demand for granite occurred after the 1906 San Francisco earthquake; granite from the Raymond area, considered by many to be the best quality in the country, was used to replace many of the buildings in San Francisco.

Timber

Since the 1850s, timber has been a crucial economic resource and shaping force in Madera County. The word "madera" itself means "lumber" or "wood" in Spanish, and the city which bears this name owes its beginnings to the timber industry.

The first timber operations in the county were owned by independents and functioned mainly to meet the needs of the gold mines. In 1852, the first sawmill was constructed, approximately five miles east of present-day Oakhurst on Redwood Creek. Subsequent mills were constructed at Crane Valley (now Bass Lake), Oakhurst, North Fork, and Madera.

Shortly after the first timber mill was constructed, the industry was monopolized by two giant firms, the California Lumber Company (later, the Madera Flume and Trading Company), and the Madera Sugar Pine Company. Construction of the railroads through the county in 1872 had a tremendous effect on the timber industry, making it possible to transport much greater quantities of timber to more distant locations. Construction of the Madera flume by the California Lumber Company made it possible to transport lumber to the valley, where it connected with the Central Pacific Railroad. At the valley terminus of the flume, the townsite of Madera was laid out; hence, the beginnings of the city of Madera. Later, a mill was built at Madera.

Agriculture

The first farms in the Central Valley were on Mexican land grants. The only land grant lying within the area that is now Madera County was the Rancho of the River San Joaquin, owned by general Jose Castro. The rancho covered 47,740 acres along both sides of the San Joaquin River, from a few miles north of Friant to a few miles south of Herndon. Castro never developed his land, however, as the Mexican-American War was developing in 1846 just as he received the land. The General promptly abandoned the land.

Early farming activities by European immigrants occurred mostly in the foothills and mountains, near roads or trails in the mining areas; this was where the water to sustain agriculture, as well as the population, was located. The first farms produced mainly fruit trees; there were orchards in the Crane Valley (Bass Lake), North Fork, Coarse Gold, Oakhurst, and Ahwahnee areas, among other locations. Collectively, the area was referred to as the "mountain fruit belt, " and had a reputation for producing high quality fruit.

The Alabama Settlement, formed circa 1868, represented the first farming efforts to occur in the valley part of the county. The settlement was a farm colony was purchased by three former Southern plantation owners who, during the reconstruction period after the Civil War, had become frustrated with their situation, and wished to start new lives in the west. Due to inexperience and harsh weather conditions, the settlers were not very successful in their farming efforts.

The formation of the city of Chowchilla was also due to a large land purchase. D.A. Robertson purchased the huge Chowchilla Ranch (whose name is an Anglicanized version of "Chauchila," the name of the Yokuts tribe that once inhabited the area) in 1912, laid out the town site, and advertised the sale of plots of fertile farmland surrounding the town. Chowchilla even had its own railroad (until 1954) which provided passenger and freight service to the outlying farms west of the town.

The communities of Trigo, Berenda, and Nipinnawasee had similar beginnings as agricultural settlements, with Trigo and Berenda located on the rail line, and Nipinnawasee beginning as a stage stop along the stage route through the mountains. Fairmead, approximately 12 miles north of Madera, was also established as

the result of a land purchase. Commerce and industry formed its economic underpinnings, and the town was fairly successful until the state highway was rerouted away from the town.

Unsuccessful farming efforts in the valley were largely attributable to lack of water in the summer months, as well as frequent drought conditions. In response to this situation, the first irrigation canals were built in the valley area of the county in the 1870s. Among the major crops grown were grains, grapes for wine and raisins, olives, and cotton. Grapes and cotton would become the county's major crops. Upon the introduction of alfalfa, dairying and cattle producing would also become large agricultural industries. With the construction of Friant Dam in 1942, the amount of acreage under cultivation doubled.

Recreation

Madera County's recreational amenities were realized very early. Yosemite Valley, in particular, has been a popular tourist attraction since the late 1800s. Several foothill and mountain communities have thrived because of the flow of people to Yosemite. Bass Lake, which was at one time a valley (Crane Valley), is now a popular resort community. The community of Wishon is also in this area, on the south shore of the lake. This community experienced its greatest growth in 1922, when the railroad came to the area.

HISTORIC SITES AND BUILDINGS

There are currently two architectural sites in Madera County which are recognized as having National or State historic significance: the Madera County Courthouse and the Miwok Indian Round House (Wassama Round House State Historical Park).

Madera County Courthouse

The Madera County Courthouse is located at 210 West Yosemite Avenue in the city of Madera. The Courthouse was built in 1900 and was placed on the National Historic Register of Historic Places in 1971. The County currently owns the property, which hosts the Madera County Museum, and is managed by the Madera County Historical Society.

Miwok Indian Round House (Wassama Round House State Historic Park)

Approximately one-half mile northeast of Ahwahnee is the Miwok Indian Round House. Also known as a "hangi," the site includes a Native American cemetery. The original round house was ceremonially burned in honor of the last chief's death in 1893, and later rebuilt in 1903 on its original site. The site was placed on the State Historic Register in 1991.

Other Potentially Significant Sites

Fifty-five other sites of potential local historic significance have been identified in Madera County; these sites are listed in Table 5-1 and their locations are depicted in Figure 5-1.

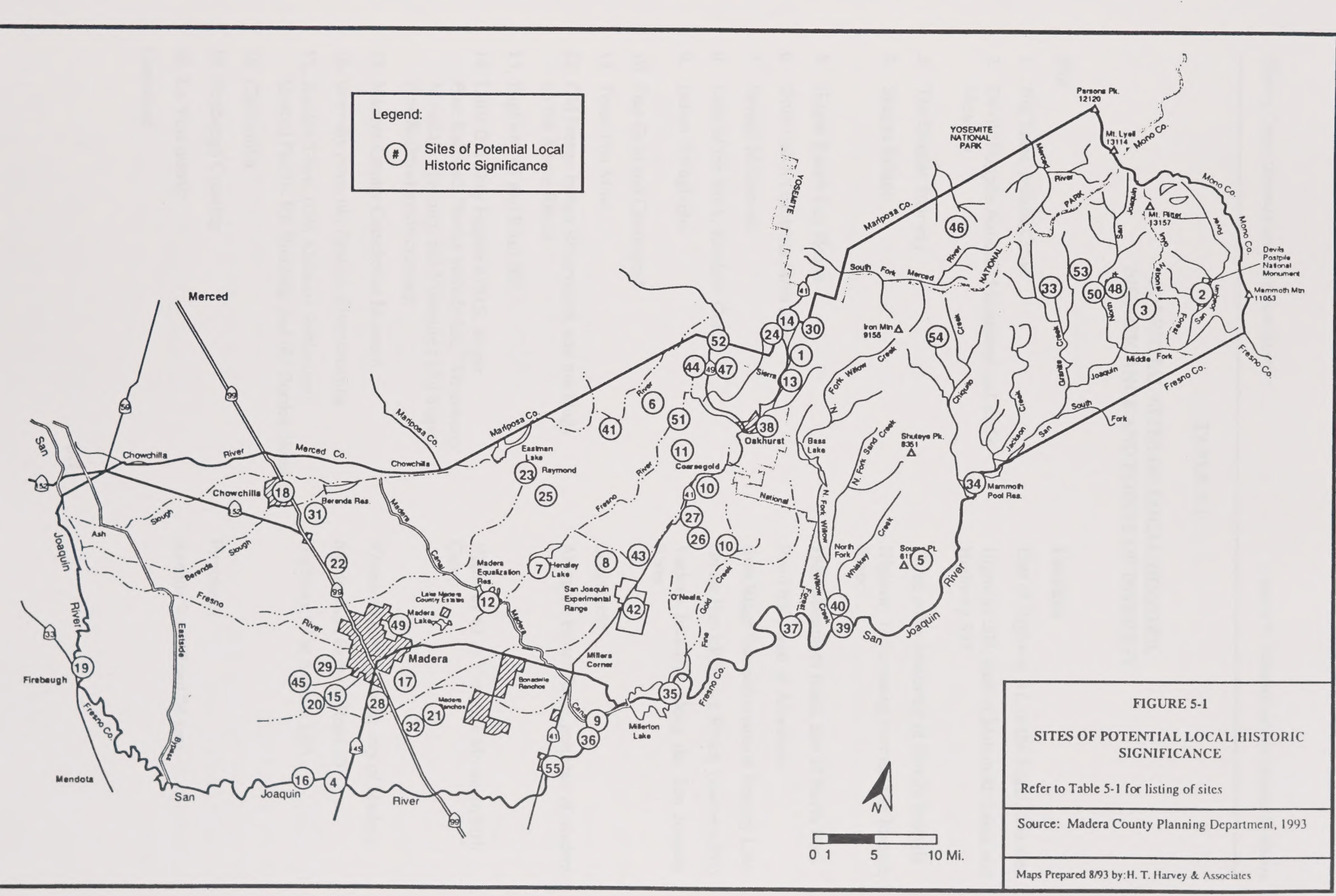


FIGURE 5-1

SITES OF POTENTIAL LOCAL HISTORIC SIGNIFICANCE

Refer to Table 5-1 for listing of sites

Source: Madera County Planning Department, 1993

Maps Prepared 8/93 by: H. T. Harvey & Associates

TABLE 5-1

POTENTIAL SITES OF LOCAL HISTORIC SIGNIFICANCE AND POINTS OF INTEREST

Site	Location
1. Big Trees, Nelder Grove	East of Highway 41, in the Sugar Pine area
2. Devils Postpile National Monument and Red's Meadow	Highway 203, west of Mammoth Lakes and Highway 395
3. The Granite Stairway	Three miles southwest of Devil's Postpile
4. Skaggs Bridge	Highway 145 crossing over the San Joaquin River
5. Hogue Ranch Log House	1860 Mammoth Road, east of North Fork
6. Grub Gulch/Gambetta Mine area	Road 600, west of Ahwahnee
7. Savage Monument	Bulk Ridge Recreation Area at Hensley Lake
8. Lady of the Rock, Kelshaw Corner	On the Herrick Brown Ranch (inaccessible)
9. Indian Petroglyphs	Various locations along the San Joaquin River
10. Fine Gold and Coarsegold	
11. Texas Flat Mine	Coarsegold
12. Old Fresno Indian Reservation, and markings on the Adobe Ranch	Along the Fresno River, northeast of Madera
13. Highway 41 and Road 208	
14. Little Old Shay Engine #1315, Sugar Pine Railroad, "Swiss Melody Inn," Thornberry Mountain Museum, and Yosemite's Old Sugar Pine Railroad grade crossing	Highway 41 at Yosemite Mountain/Fish Camp
15. Madera County Courthouse Museum	Yosemite Avenue in the city of Madera
16. Gravelly Ford, old Spanish River crossing	San Joaquin River at Road 25
17. Borden Town, (Old Alabama Settlement), Central Pacific RR Building, and old Borden Hotel site	Highway 99 at Avenue 12½
18. Chowchilla	
19. Firebaugh Crossing	Firebaugh
20. La Vina district	Avenue 9 and Road 24 area

Continued

TABLE 5-1 (Continued)

POTENTIAL SITES OF LOCAL HISTORIC SIGNIFICANCE AND POINTS OF INTEREST

Site	Location
21. Trigo	
22. Berenda	
23. Raymond "Wildcat Station"	Raymond
24. Miami Ranger Station	
25. Knowles Granite Quarry	Knowles
26. "Norbo"	East of Highway 41 and south of Road 417
27. Picayune Indian settlement	Road 417, east of Highway 41
28. Chinese Cemetery	Avenue 12 at Road 28½
29. Monte Redondo	Road 24 near Avenue 12
30. Sugar Pine Lumber Mill	East of Highway 41, at Sugarpine
31. Califa	Intersection of Highways 152 and 99
32. Irrigosa	Highway 99, north of Avenue 9
33. Strawberry Tungsten Mine Ranger Station	1½ miles northwest of Clover Meadow
34. Mammoth Pool	
35. Friant	Now Millerton Lake
36. Ledger Island	San Joaquin, downstream from Friant Dam
37. Kerckhoff Lake	San Joaquin River, south of North Fork
38. Oakhurst ("Fresno Flats")	
39. Redinger Lake	San Joaquin River, southeast of North Fork
40. Exact center of the State of California	Southeast of North Fork, along Highway 41.
41. Summit House	Raymond
42. Zebra Mine	Near Kelshaw Corners, east of Highway 41 (private property)
43. Kelshaw Corners	Highway 41 at Road 207
44. Ahwahnee Station	Along the old State Route to Yosemite
45. Intersection of Howard Road, Olive Avenue, and Yosemite Avenue	City of Madera
46. Yosemite National Park	Northeastern Madera County

Continued

TABLE 5-1 (Continued)

POTENTIAL SITES OF LOCAL HISTORIC SIGNIFICANCE AND POINTS OF INTEREST

Site	Location
47. Miwok Indian Round House	Road 628, north of Highway 49
48. 77 Corral	Corral Meadow, 6 miles southwest of Devil's Postpile
49. Kismet Tower	Crossing of Southern Pacific and Santa Fe Railroads, east of Madera
50. Sheep Crossing	8½ miles southwest of Devil's Postpile
51. Mining areas near Oakhurst	South of Highway 49 and west of Highway 41
52. Nipinnawasee	North of Oakhurst
53. Chetwood Cabin	Along Chetwood Creek, 8½ miles southwest of Devil's Postpile
54. Globe Rock	9½ miles north of Shuteye Peak
55. Lane's Bridge	Old Highway 41 crossing of the San Joaquin River
56. Sierra Mono Museum	Southeast corner of Road 274 and Road 225

See Figure 5-1 for locations

Source: Madera County Planning Department, 1993

5.4 RECREATION

This section inventories and describes recreation facilities and opportunities in Madera County according to the following categories:

1. State Park Facilities
2. Federal Park Facilities
3. Lakes
4. Trails and Scenic Areas
5. Local Recreation Facilities
6. Other Recreation Facilities

Madera County does not have a park or recreation department and does not play a significant role in providing recreational facilities. The federal government, due to its holdings of public open land in the Sierra National Forest, provides an abundance of recreation and tourism opportunities for the eastern part of the county and to visitors from outside Madera County. For these reasons, this section focuses primarily on the roles of state and federal governments in recreation, and discusses how the County's role as a recreation provider can be expanded.

STATE PARK FACILITIES

The State of California maintains a State Park system consisting of over 150 units and nearly 600,000 acres. Areas selected to become state parks usually can be classified under one of the four following headings:

1. Natural scenery of unusual beauty
2. Outstanding examples of vegetative growth, animal populations, or geological formations
3. Historical areas or buildings that should be preserved for posterity
4. Physical qualities that give the area outstanding value for recreational purposes

Two such areas have been identified by the State Park Commission, which is charged with the administration of the State Park system. These two areas are the Millerton State Recreation Area, located in both Madera and Fresno Counties, and the Wassama Round House in Ahwahnee.

Millerton Lake State Recreation Area

The Millerton Lake State Recreation Area (SRA) is located on approximately 5,700 acres in Madera and Fresno Counties, and offers such facilities as boat ramps and docks, campgrounds, picnic facilities, public restrooms, and drinking water. An entrance fee to the recreation area is charged at the gate.

Wassama Round House State Historic Park

The Wassama Round House in Ahwahnee is one of only two or three authentic ceremonial Indian Roundhouses surviving in California. The Round House is maintained by members of local Miwok Indian tribes under the sponsorship of the California State Park system. The Park is open daily and guided tours of the park are available by appointment with a small fee.

FEDERAL RECREATION FACILITIES

Federal recreation facilities are primarily those in the Sierra National Forest. The Sierra National Forest comprises approximately 447,000 acres of eastern Madera County. Because of its status as publicly-owned open space and its inviting environment, the Sierra National Forest provides many of Madera County's recreational opportunities.

Camping

Camping is the most prevalent recreation opportunity in the Sierra National Forest. Approximately 19 Sierra National Forest campgrounds have identified either North Fork, Bass Lake, or Oakhurst as their listing town:

North Fork:	9 Campgrounds
Bass Lake:	4 Campgrounds
Oakhurst:	6 Campgrounds

These campgrounds offer a wide range of amenities from RV campgrounds with full hookups to areas that do not have potable water on site. Activities at these campgrounds vary from location to location and may include fishing, swimming, boating, equestrian trails, and hiking on National Forest hiking trails. Sierra National Forest campgrounds in Madera County are listed in Table 5-2. In addition, a number of backcountry and day-use facilities beyond those mentioned in Table 5-2 are also administered and maintained by the Sierra National Forest.

TABLE 5-2

SIERRA NATIONAL FOREST CAMPGROUNDS IN MADERA COUNTY

Name	Location	No. of Sites	Recreational Facilities
Grey's Mountain	Hwy. 41 to Sky Ranch Rd. to Rd. 6S4D - 10 mi.	12	Hiking, fishing
Fresno Dome	Hwy. 41 to Sky Ranch Rd.	12	Hiking, fishing
Kelty Meadow	Hwy. 41 to Sky Ranch Rd.	12	Hiking, fishing, horses okay
Soquel	Hwy. 41 to Sky Ranch Rd. to Rd. 6S40 - 8 mi.	14	Hiking, fishing
Little Sandy	Hwy. 41 to Jackson Rd. (Rd. 6S07)	10	Fishing, hiking
Big Sandy	Hwy. 41 to Jackson Rd (Rd. 6S07)	14	Fishing, hiking
The Forks	Hwy. 41 to Rd. 222 - (Bass Lake turnoff) Stay right at both forks	31	Hiking, fishing, boating, swimming
Lupine-Cedar	Hwy. 41 to Rd. 222 - (Bass Lake turnoff) Stay right at both forks	113	Hiking, fishing, boating, swimming
Spring Cove	Hwy. 41 to Rd. 222 (Bass Lake turnoff) Stay right at both forks	63	Fishing, hiking, boating, swimming
Wishon Point	Hwy. 41 to Road 222 (Bass Lake turnoff) Stay right at both forks	46	Fishing, hiking, swimming, boating
Granite Creek (60 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Minarets Rd (Rd 4S81)	20	Fishing, horses okay
Lower Chiquito (44 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Minarets Rd (Rd 4S81)	17	Fishing
Mammoth Pool (44 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Minarets Rd (Rd 4S81)	47	Swimming, boating, fishing, water skiing
Rock Creek (27 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Minarets Rd (Rd 4S81)	18	Fishing, swimming
Soda Springs (41 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Minarets Rd (Rd 4S81)	16	Fishing, hiking
Sweetwater (41 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Minarets Rd (Rd 4S81)	16	Fishing, swimming, hiking

TABLE 5-2 (Continued)

SIERRA NATIONAL FOREST CAMPGROUNDS IN MADERA COUNTY

Upper Chiquito (46 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) then Rd. 225, left at Rd. 274, right at Baesore Rd (Rd. 6S05)	20	Primitive camp, fishing, hiking
Whiskey Falls (10 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) then Rd. 225 (Mammoth Pool Rd.) to Rd. 233 (Cascadel Rd.) then left on Road 8709	14	Fishing, hiking, camping
Whiskers Camp Site (18 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Rd. 225, left at Rd. 274, right at Central Camp Rd. 6S42	8	Hiking, fishing, camping
Redinger Lake (12 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Rd. 225, right at Indian Creek Trailer Park	0	Fishing, swimming, boating, hiking
Placer Camp (43 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Rd. 225, left on Minarets Rd 4S81	7	Camping, hiking
Little Jack Ass (41 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Forks turnoff) to Rd. 225, left on Minarets Rd. 4S81	5	Primitive camping, fishing, hiking
Gaggs Camp (21 mi. from North Fork)	Hwy. 41 to Rd. 200 (North Fork turnoff) to Rd. 225, left on Rd. 274, right at Rd. 6S42	9	Camping, fishing, hiking

Sources: U.S. Forest Service, 1993, and Larry Curtiss, Ranch Manager, Bonnie-B, North Fork, 1993

Yosemite National Park

A portion of Yosemite National Park occupies a large region in northeast Madera County. This portion of Yosemite provides a number of backcountry trails, streams, and small lakes. While the majority of the Park's recreational opportunities lie outside of Madera County, its relative proximity to the county makes it a significant recreational resource.

Nelder Grove

Nelder Grove is a redwood grove designated as a Scenic Area within the Sierra National Forest. It includes a number of hiking trails and scenic spots.

Ansel Adams Wilderness

About 100,000 acres of the Ansel Adams Wilderness lies within Madera County. The area is a congressionally-designated wilderness area and can only be entered on horse or foot. Primary recreation opportunities are backpacking, hiking, and trail pack-riding.

Devil's Postpile National Monument

The Devil's Postpile National Monument was officially designated as such by President Taft in 1911. The monument consists of a "spectacular mass of basaltic columns like an immense pile of posts". "These columns vary in size from ten to thirty inches in diameter and in some cases stand as high as sixty feet." (*Historic Spots in California,* Hoover and Rensch).

Squaw Leap Recreation Area

The Squaw Leap Recreation Area, owned by the Bureau of Land Management (BLM), straddles the San Joaquin River in both Fresno and Madera Counties. Most of the development of the site is on the Fresno side of the river; however, a 10-mile loop trail is located mostly on the Madera County side of the area, as are picnic sites and other recreational opportunities.

MADERA COUNTY RECREATIONAL LAKES

Lakes and streams in Madera County offer an excellent recreation opportunity for picnics, boating, water skiing, swimming and fishing. In addition to the Millerton Lake State Recreation Area, the following have been identified in the *1993 Southern Yosemite Visitor's Guide* and by U.S. Forest Service staff. Numerous small lakes and streams are also located in the eastern side of Madera County

Mammoth Pool

Mammoth Pool is a major trout lake located approximately 40 miles east of North Fork on the San Joaquin River. Southern California Edison maintains the dam while the U.S. Forest Service maintains the recreation facilities. A boat-in campground is in place on site.

Bass Lake

Officially called Crane Valley Reservoir, Bass Lake was created in 1899 when a small dam was built in Crane Valley. Bass Lake has been a favorite spot of fishermen, water skiers, and picnickers due to its low elevation, proximity to the valley, and quality facilities.

Hensley Lake

Created by the mile-long Hidden Dam on the Fresno River and located about 17 miles northeast of Madera, Hensley Lake provides camping, fishing, picnicking, waterskiing and other recreational activities. Hensley lake is maintained by the U.S Army Corps of Engineers.

Eastman Lake

Eastman Lake is located on the Chowchilla River, created by Buchanan Dam. It is approximately 25 miles northeast of Chowchilla. Eastman Lake offers hiking and equestrian trails, a campground, boating ramps, and picnicking.

Manzanita Lake

Relatively secluded Manzanita Lake is a good fishing lake stocked with rainbow trout through the summer. It is located on Willow Creek, approximately two miles north of North Fork.

Redinger Lake

Redinger Lake is a reservoir on the San Joaquin River, created and operated by Southern California Edison. A popular water skiing spot, approximately 60 to 100 boaters use on summer weekend days. Redinger Lake is located 15 miles south of North Fork and is falls in both Fresno and Madera Counties.

TRAILS AND SCENIC AREAS

Sierra National Forest Trails

The Sierra National Forest offers numerous trails for scenic walks, day hikes, and backpacking trips. These trails cover approximately 300-400 miles in Madera County. Specific information on trails can be obtained from the Sierra National Forest headquarters.

Oakhurst River Parkway

The proposed Oakhurst River Parkway would provide a scenic walking path with pedestrian bridges, lighting, and observation decks along the Fresno River at Highway 41 to the Yosemite High School campus (see Figure 5-2). The Eastern Madera County Chamber of Commerce requested Madera County to submit an application for funding for the parkway through the National Recreational Trails Fund Act of 1991. The County appointed the Oakhurst River Parkway Committee of the Chamber of Commerce to act as the County 's agent to conduct all negotiations and to submit all necessary applications.

The Oakhurst River Parkway Committee has already been successful in obtaining a grant from the California Department of Water Resources. This $47,500 grant will be used to improve conditions such as erosion and flood control.

Sierra Vista Scenic Byway

The Sierra Vista Scenic Byway is a 100-mile loop beginning in North Fork and continuing around the Minarets Ranger District. Elevations when travelling the Byway range from 2,600 to 7,000 feet. Along the way, a number of historic spots, scenic overlooks, and geologic oddities make the Sierra Vista Scenic Byway a worthwhile trip. The Sierra Vista Scenic Byway Route is shown in Chapter 3, *Transportation.*

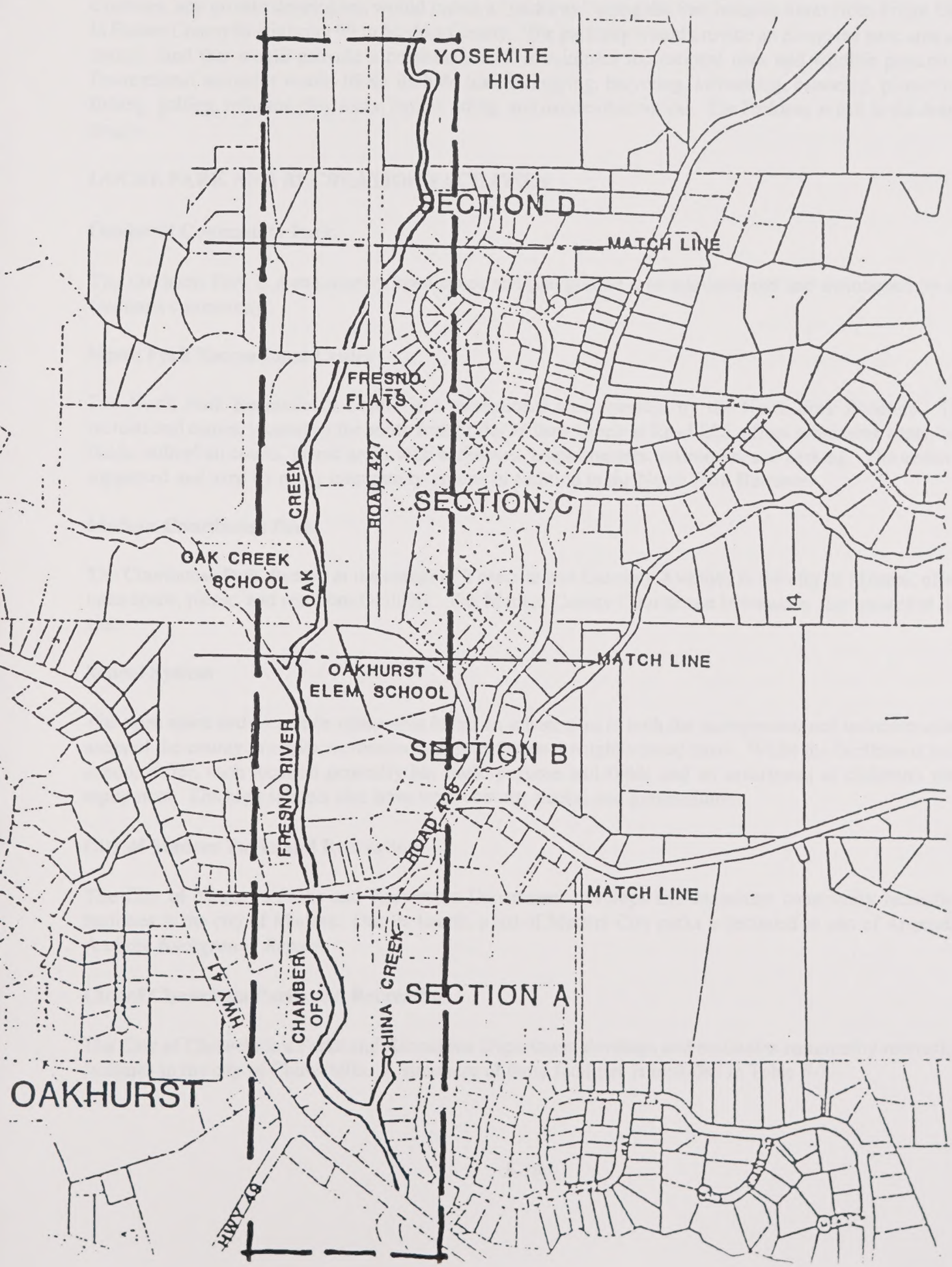
An effort is underway by the Minarets Ranger station of the Sierra National Forest and some North Fork residents to have Road 200 designated as a Scenic Byway between Highway 41 and North Fork. This would create a continuous scenic corridor from Highway 41 to the beginning of the existing scenic route.

Proposed Chowchilla Bike and Hike Trail

The proposed Chowchilla Bike and Hike Trail is a cooperative effort between the City of Chowchilla, Madera County, and private developers. The first phase is a path along the lengths of the Berenda and Ash Sloughs connected by State Route 152 and Road 13. The second phase is a northern extension bordered by the Chowchilla River to the north, Road 13 to the west, and Santa Fe Drive to the east. A completed path would offer a clearly designated route for cyclists, joggers, and recreational walkers. The City of Chowchilla is currently in the process of obtaining a right-of-way easement for the path. Design work is scheduled to begin in winter of 1993 and construction for spring of 1994.

FIGURE 5-2

PROPOSED OAKHURST RIVER PARKWAY



Proposed San Joaquin River Parkway

The proposed San Joaquin River Parkway, a joint effort between the City of Fresno, Fresno and Madera Counties, and private developers, would create a "parkway" along the San Joaquin River from Friant Dam in Fresno County to Highway 99 in Madera County. The parkway would provide an elongated park area and natural land that would provide a combination of low-impact recreational uses and wildlife protection. Recreational activities would likely include hiking, jogging, bicycling, swimming, canoeing, picnicking, fishing, golfing, informal play areas, equine riding, and nature observation. The Parkway is still in the design stages.

LOCAL PARK AND RECREATION FACILITIES

Oakhurst Community Park

The Oakhurst Park is a community open space and playground area administered and maintained by the Oakhurst community.

North Fork Recreational Center

The North Fork Recreational Center is a recreational area operated by the North Fork Boosters. The recreational center, located on the south fork of the Willow Creek at Road 225, offers swimming areas, ball fields, volleyball courts, picnic areas with barbecues, amphitheaters, restrooms, and parking. The center is supported and used by many community groups in addition to the North Fork Boosters.

Madera Courthouse Park

The Courthouse Park, located at the corner of Yosemite and Gateway Avenues in the city of Madera, offers open space, picnic, and restroom facilities. The Madera County Courthouse Museum is also located at this site.

School System

The open space and recreation equipment found on school sites in both the incorporated and unincorporated areas of the county provides recreation opportunities on a neighborhood basis. While the facilities at each school differ, each location generally has multi-purpose ball-fields and an assortment of children's play equipment. The high schools also have tennis courts, tracks, and gymnasiums.

City of Madera Parks and Recreation

The City of Madera's Parks and Recreation Department develops and maintains community recreation facilities in the city of Madera. Due its length, a list of Madera City parks is included as part of Appendix A of the *Background Report.*

City of Chowchilla Parks and Recreation

The City of Chowchilla's Parks and Recreation Department develops and maintains community recreation facilities in the city of Chowchilla. A summary of these facilities is included in Table 5-3.

TABLE 5-3

CHOWCHILLA RECREATIONAL FACILITIES

Name	Facilities
Downtown Ball Diamonds	3 baseball diamonds
Rotary Park	Playground area - open space
Sports and Leisure Center	2 Ball Diamonds, open space, Lioness shelter covered group area
Community Sports Center	Parks and recreation office
Veterans Memorial Park	Play area, Lions shelter covered group area
Senior Citizens Center	Senior center facilities
Berenda Reservoir Park	Covered shelter, BBQ, open space

Source: City of Chowchilla, 1993

OTHER RECREATION OPPORTUNITIES

Group Camping

According to the *1993 Southern Yosemite Visitors Guide,* approximately 25,000 children and adults are estimated to attend Group Camping Facilities in Eastern Madera County each year. Sponsorship of the camps is varied; many are affiliated with church organizations, while some are traditional summer camps. Madera County group camps are listed in Table 5-4.

TABLE 5-4

GROUP CAMPING FACILITIES
Madera County

Name and Affiliation	Location
Calvin Crest: Presbyterian	45800 Calvin Crest Rd., Oakhurst
Camp Sugar Pine: American Baptist	48478 Mill Canyon Rd., Oakhurst
Episcopal Conference Center: Episcopalian	P.O. Box 1355, Oakhurst
Camp Green Meadows: Traditional Summer Camp	P.O. Box 69, Fish Camp
Jackass Rock Camp: Groups Only	P.O. Box 431, Chowchilla
Oakhurst Christian Conference Center: Church of God	36616 Mudge Ranch Rd., Coarsegold
Skylark Ranch Camp: Traditional Summer Camp	P.O. Box 298, Ahwahnee
Summit Adventures: Non-denominational	P.O. Box 498, Bass Lake
Yosemite Bible Camp: Church of Christ	50869 Road 632, Oakhurst
Yosemite Sierra Summer Camp: Non-denominational	P.O. Box 449, Bass Lake

Source: *1993 Southern Yosemite Visitors Guide*

Community Events

Several annual events present opportunities for recreation, as well as community involvement and participation. These events include: County Fair at Chowchilla, Chowchilla Stampede, Coarsegold Rodeo, Madera District Fair, North Fork Loggers Jamboree, Sierra Mountaineer Days, and Oakhurst Flea Markets.

Private Recreation Facilities

There are numerous privately-operated recreation facilities within Madera County; most are located in the cities and larger communities in Madera County. Some of the more common facilities are golf courses, tennis courts, sporting clubs, theaters, and bowling alleys. In addition, several county businesses welcome visitors to tour their facilities on organized tours. Among these businesses are: Oberti Olives, Ficklin Winery, and Quady Winery in Madera, and Sierra On-Line and Chateau Miel in Oakhurst.

BICYCLING

Due to the mountainous terrain in the eastern part of the county, most bicycling opportunities are found in western Madera County. The County prepared the *Madera County Commuter Bike Plan* in 1982. This report identified existing bike routes for commuting riders and suggested improvements necessary to complete a local bikeway system. This document was not a comprehensive, however, and was not fully implemented.

Madera County and the City of Madera have received joint funding for the preparation of a comprehensive bike plan. When completed, this plan will address the needs of both commuting and recreational cyclists throughout the county, and will identify safe and convenient routes to key locations. This plan will be initiated during the fall of 1993.

5.5 FINDINGS

- Most of the archaeological survey work, and consequently most of the recorded sites, in Madera County has occurred in the eastern county.
- One of the most intensively studied areas in the county in terms of its prehistory is the Eastman Lake area along the Chowchilla River.
- Devil's Postpile National Monument is a prehistoric resource originating approximately one million years ago.
- The remains of a number of prehistoric animals was recently unearthed at the site of the Fairmead landfill expansion.
- The Native American group inhabiting the foothill areas of Madera County in ethnographic times were known as the Northern Valley Yokuts, who were part of a larger group of Yokuts inhabiting the San Joaquin Valley.
- The Native American group inhabiting the North Fork/O'Neals area during ethnographic times were the Northfork Mono, part of larger linguistic group called the Monache.
- Historic settlement patterns of Madera County have been closely linked to economic development of the county's natural resources.
- The first large wave of immigrants to Madera County was due to the discovery of gold in California.
- After gold, the two most historically significant mineral resources for the county were copper and granite.
- Since the 1850s, timber has been a continuing resource of significance for the county, and the existence of communities such as Madera, Oakhurst, and North Fork is due to development of this resource.
- Agriculture has been, and continues to be a crucial economic resource for the county, and is responsible for the settlement of communities such as Chowchilla, Trigo, Berenda, Fairmead, and Nipinnawasee.
- Madera County's recreational amenities, such as Yosemite and the Bass Lake area, were recognized and enjoyed very early on in the county's history.
- There are currently two architectural sites in Madera County which are recognized as having National or State historic significance: the Madera County Courthouse and the Miwok Indian Round House (Wassama Round House State Historical Park).
- Opportunities for recreation and tourism are abundant in eastern Madera County and the Sierra National Forest. Federal and state agencies operate numerous campgrounds, boating facilities, and picnic areas. These areas will continue to provide significant recreation opportunities for Madera County citizens.
- The western part of Madera County does not have the benefit of state and federal recreational resources. Residents must rely on schools, private recreation facilities, and city parks in Madera and Chowchilla,

and recreational facilities in Fresno. At the very least, the valley part of the county could use a regional park.

- There are currently three annual competitive grant programs available to assist counties with funding for park and recreation facilities. These programs are the Habitat Conservation Program, National Recreation Trails Program, and the Water Conservation Funds Program. Madera County applied for two grants in 1993 which are pending, for a pool site in Chowchilla and a pool site in Madera.

5.6 PERSONS CONSULTED

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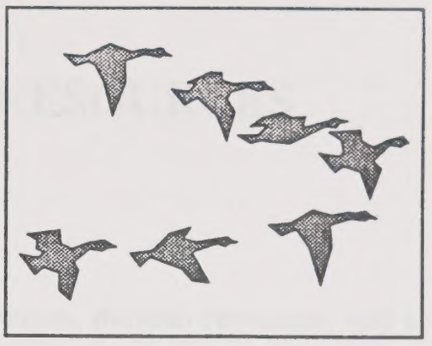


CHAPTER 6

AGRICULTURAL AND NATURAL RESOURCES

CHAPTER 6

AGRICULTURAL AND NATURAL RESOURCES

6.1 INTRODUCTION

The agricultural lands, soils, water, vegetation and wildlife, timber resources, mineral resources, and air quality in Madera County contribute to the county's economy and are key elements in the quality of life of Madera County residents. This chapter presents background information on Madera County's natural and agricultural resources, including agriculture and soil resources, timber, mineral resources, water resources, biological resources, and air quality.

6.2 AGRICULTURAL SOILS AND RESOURCES

This section inventories and discusses the various soil types and agricultural production in Madera County.

SOIL ASSOCIATIONS

A soil association is formed by the occurrence of two or more soils in a repeating pattern. Countywide soil information is limited to reports and soil maps prepared by the U.S. Soil Conservation Service (SCS). The SCS completed a soil survey of the valley portion of Madera County in 1951 and identified 14 soil associations in the Madera area (see Figure 6-1). Within each soil association are numerous soil classifications. Specific information on soil types can be found in the SCS's *Soil Survey: Madera Area California* (1951). The report groups soil associations into four major categories:

- Recent alluvial fans and floodplains
- The basin area
- Older alluvial fans and terraces
- The uplands

The names of the associations indicate the dominant soils in the association. Within the associations, a number of other soil types occur; these generally have the same basic chemical features as the dominant soils and usually have different physical qualities that distinguish them as a type.

Recent Alluvial Fans and Floodplains

These soils occur on nearly level areas along drainage ways, with the major fans occurring along the Fresno and Chowchilla Rivers and the northern portion of the San Joaquin River fan. These soil associations are similar in that they range from basically nonsaline and nonalkali to slightly saline-alkali. They are well-drained and moderately coarse to medium textured soils that occur at elevations ranging from approximately 110 feet to 400 feet. There are three associations within this group:

- Pachappa-Grangeville Association
- Hanford-Tujunga Association
- Columbia-Temple Association

The Basin Area

The Basin Area is comprised of older alluvial soils that cover much of the extreme western portion of the county. Where elevations range from approximately 125 feet to 165 feet above sea level. The area contains four soil associations which tend to consist of fine, water-transported sediments. The soils are slightly to strongly calcareous and non-saline non-alkali, to strongly saline-alkali. The soils are comprised of shallow to moderately deep surface soil over lime-silica hardpan (with the exception of the Traver-Chino association, whose subsoil is similar to the surface soil, with a higher clay content). There are four soil associations within the Basin Area.

- Fresno-El Peco-Pozo
- Fresno-El Peco
- Dinuba-El Peco
- Traver-Chino

Soils of the Older Alluvial Fans and Terraces

The soils of this association are generally found in gently rolling to slightly hilly topography, on rarely flooded terraces and benches. For this reason, they receive no fresh deposits of alluvium. This association occurs from the Madera and Chowchilla area east to the foothills. Elevation in the area ranges from approximately 180 to 500 feet. This area contains two soil associations which are similar in that their surface soils consist of large amounts of clay.

- San Joaquin-Madera
- Cometa-Whitney

Soils of the Uplands

Uplands soils are found in the foothills and low mountain areas of the county, ranging between approximately 500 and 3,000 feet in elevation. The five soil associations are basically derived from granite or schist.

- Daulton-Whiterock
- Ahwahnee-Vista
- Ahwahnee-Auberry
- Coarsegold-Trabuco
- Holland-Tollhouse

LAND CAPABILITY CLASSIFICATIONS

The U.S. Soil Conservation Service uses a Land Capability Classification System to categorize soils in terms of their capacity for farming. The classifications are based on soil limitations, the manner in which soils respond to treatment, and the risk of damage when the soils are used. Soils are ranked I through VIII, with Class I soils having the fewest limitations, the widest range of use, and the least risk of damage when they are used. Soils in the other classes have progressively less suitability for farming. Class I and II soils are generally considered to be prime farmland. Class III soil is suitable for cultivated crops, but requires additional attention to offset or overcome inherent limitations.

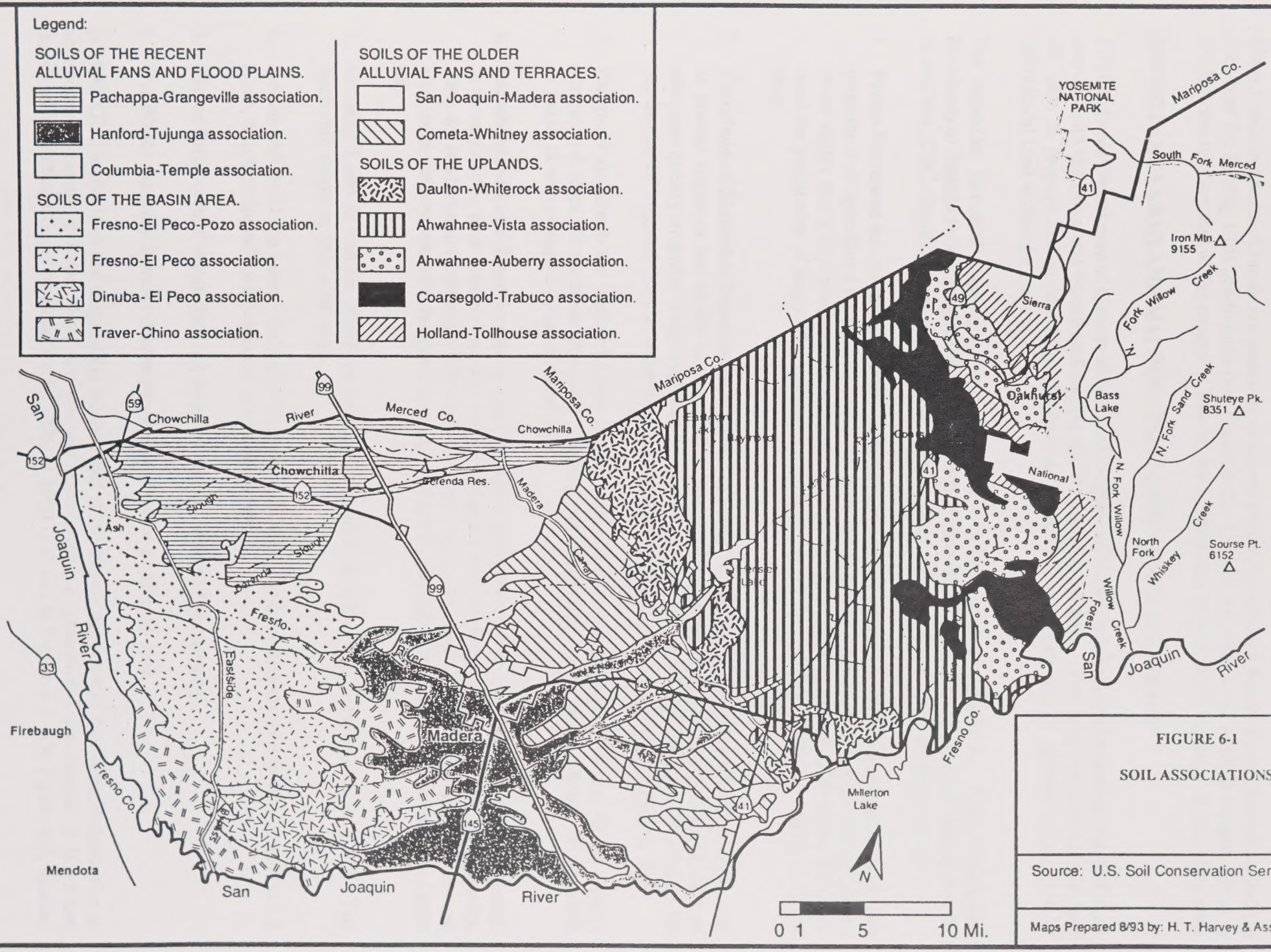


FIGURE 6-1

SOIL ASSOCIATIONS

Source: U.S. Soil Conservation Service, 1962

Maps Prepared 8/93 by: H. T. Harvey & Associates

Class I soils in Madera County are primarily centered around the cities of Madera and Chowchilla and the area near the Rolling Hills subdivision (see Figure 6-2). Class II soils run along the San Joaquin River, in the extreme western end of the county. Class III land constitutes most of the remainder of the valley area.

IMPORTANT FARMLAND MAPPING AND MONITORING PROGRAM

The California Department of Conservation's (CDC) Office of Land Conservation supplements the SCS's soil surveys with the Important Farmland Mapping and Monitoring Program. This program uses soil and land use data to prepare and update maps designating important farmlands and to monitor conversion of agricultural land within the state.

The important farmland mapping program classifies five categories of farmlands: Prime Farmlands, Farmlands of Statewide Importance, Unique Farmlands, Farmlands of Local Importance, and Grazing Lands. In addition, CDC classifies three categories of non-farmland. CDC defines these categories as follows:

1. **Prime Farmland** has the best combination of physical and chemical features able to sustain long term production of agricultural crops. The land must be cropped and be supported by a developed irrigation water supply that is dependable and of adequate quality during the growing season. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.

2. **Farmland of Statewide Importance** is similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. These lands have the same reliable source of adequate quality irrigation water available during the growing season. Land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date.

3. **Unique Farmlands** are lands of lesser quality soils used for the production of the State's leading agricultural crops. These lands are usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones of California.

4. **Farmlands of Local Importance** are lands which are of importance to the local agricultural economy, as determined by each county's board of supervisors and a local advisory committee. In Madera County, these are lands that are presently under cultivation for small grain crops, but are not irrigated. They are also lands that are currently irrigated pasture, but have the potential to be cultivated for row/field crop use.

5. **Grazing Land** is that on which the existing vegetation is suited to the grazing of livestock. The minimum mapping unit is 40 acres.

6. **Urban and Built-Up Land** is occupied by structures with a building density of at least one unit to 1.5 acres, or approximately six structures to a ten-acre parcel.

7. **Other Land** is land which does not meet the criteria of any other category.

8. The **Water** category consists of water bodies of 40 acres or more in size.

In 1990, CDC inventoried and mapped the western half of the county; land east of the Sierra National Forest boundaries is primarily federal land and was not inventoried. A generalized distribution of important farmland in Madera County as classified by CDC in 1990 is shown in Figure 6-3. On Figure 6-3, smaller

areas were too detailed to show, so categories were combined. For more detailed information, refer to the Important Farmland Map published by CDC.

As shown in Figure 6-3, the majority of land west of the Madera Canal is classified as Unique Farmland, Prime Farmland, and Farmland of Statewide Importance. In the western central portion of the county, there is a large swath of Grazing Land. The mapped area to the east of the Madera Canal is almost solely Grazing Land, with small pockets of Urban and Built-Up Land. Table 6-1 depicts the total acreage in each important farmland category.

TABLE 6-1

TOTAL ACREAGE INVENTORIED IN IMPORTANT FARMLAND INVENTORY*
Madera County
1990

	Acreage	% of Total
Farmland		
Prime Farmland	103,799	12.0%
Farmland of Statewide Importance	86,397	10.0%
Unique Farmland	156,347	18.1%
Farmland of Local Importance	39,542	4.6%
Subtotal, Non-Grazing	386,085	44.8%
Grazing Land	404,199	46.9%
Total Farmland	**790,284**	**91.7%**
Non-Farmland		
Urban Built-Up Land	19,840	2.3%
Other Land	45,524	5.3%
Water Area	5,785	8.3%
Total Land Inventoried	**861,433**	**100.0%**

*Only land west of Sierra National Forest boundary was inventoried

Source: California Department of Conservation, 1992

AGRICULTURAL PRODUCTION

Agriculture production constitutes a major portion of Madera County's economy. In 1990, over 790,000 acres were devoted to agricultural uses. The total crop value in 1992 was $607,543,000 (an increase of $123,552,000 from 1991 and $276,073,000 from 1983), with fruit and nut crops comprising 65 percent of

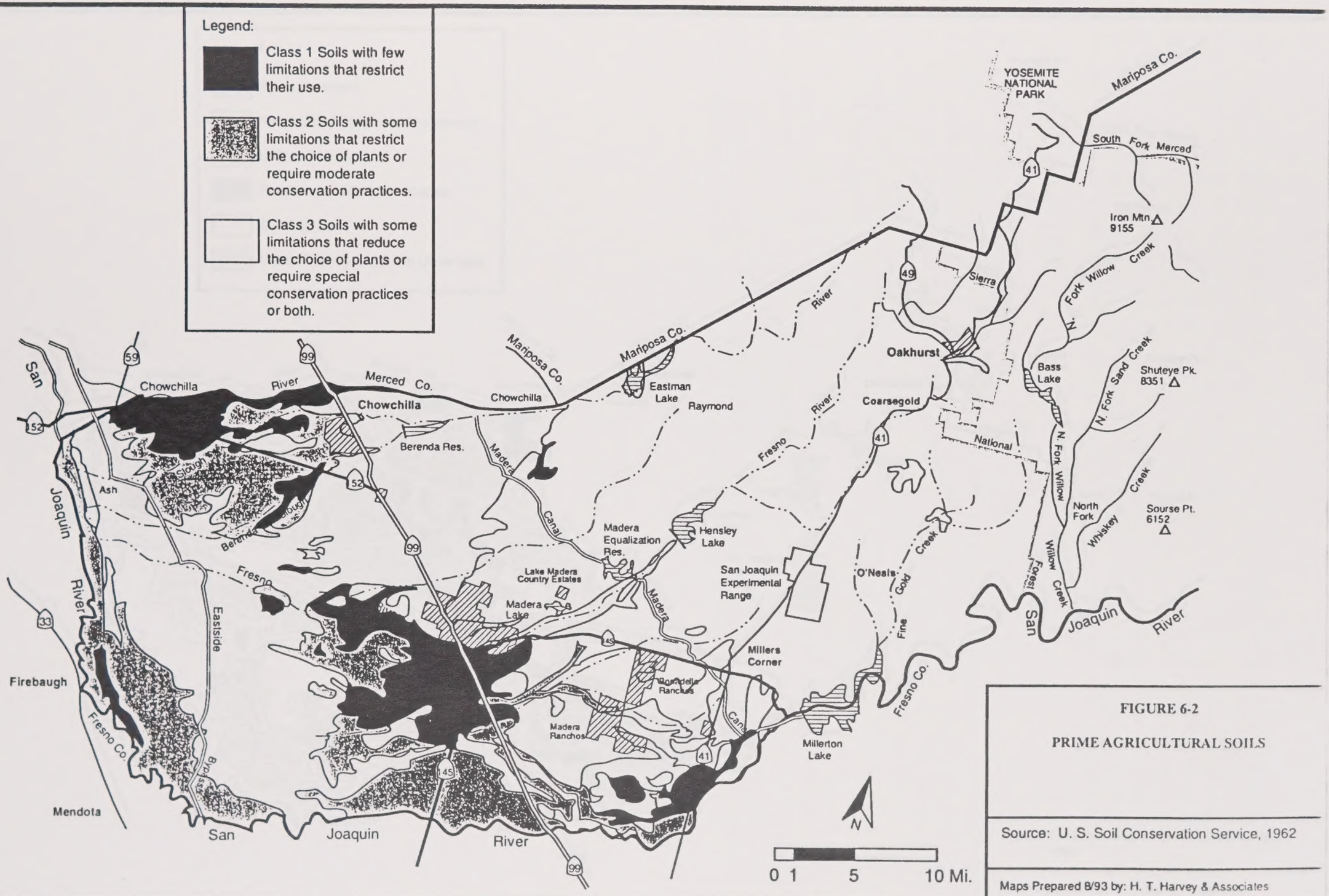


FIGURE 6-2

PRIME AGRICULTURAL SOILS

Source: U. S. Soil Conservation Service, 1962

Maps Prepared 8/93 by: H. T. Harvey & Associates

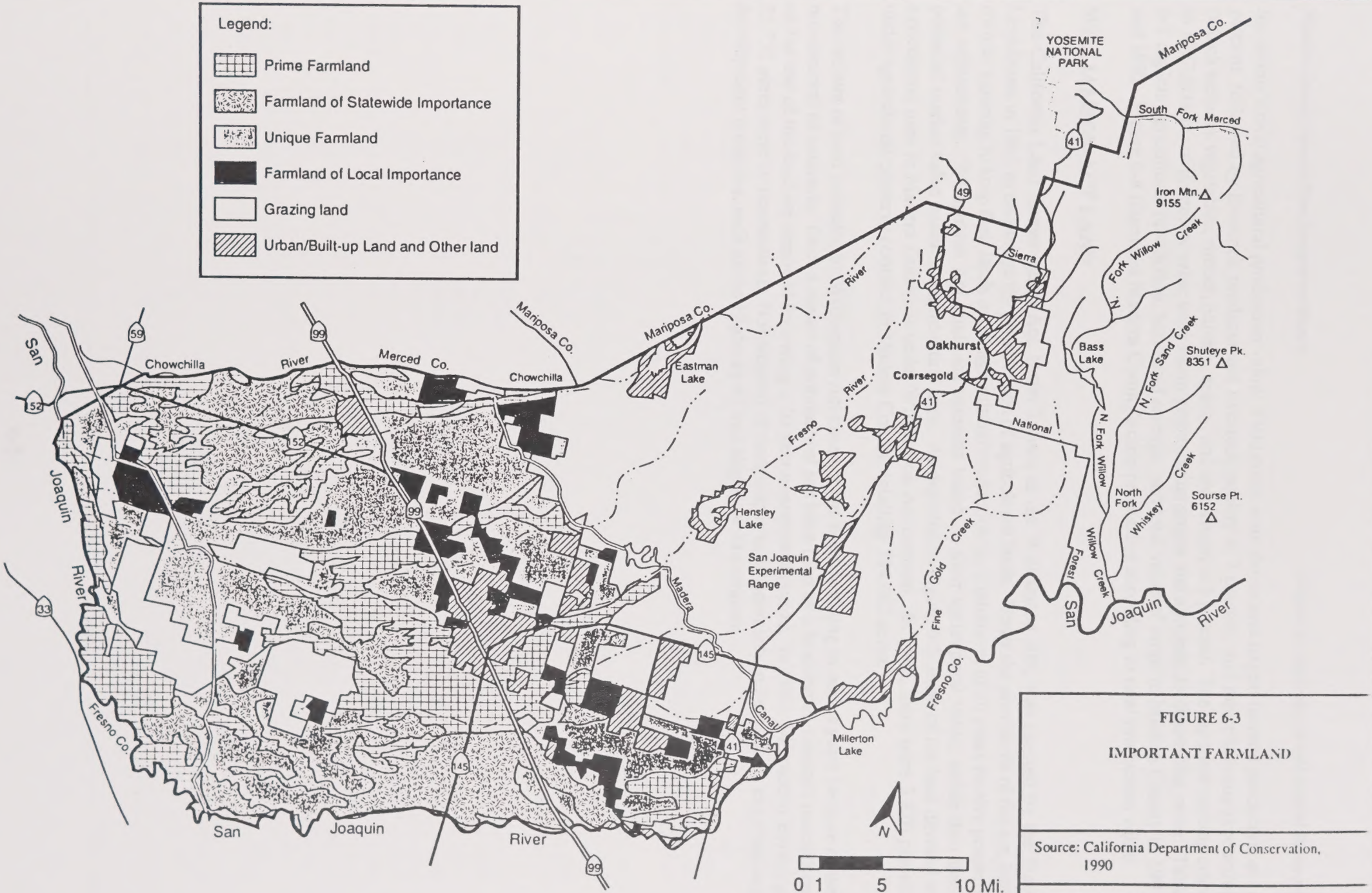


FIGURE 6-3

IMPORTANT FARMLAND

Source: California Department of Conservation, 1990

Maps Prepared 8/93 by: H. T. Harvey & Associates

the county's total agricultural production value. Field crops were the second largest income producers, at 16 percent, followed by livestock products and livestock poultry at 7 percent, and miscellaneous production (which includes vegetables, timber, nursery, apiary, and seed crops) at 6 percent. The top three ranking crops in 1992 in terms of monetary value were raisin grapes, wine grapes and almonds, in descending order. Table 6-2 depicts agricultural production, harvested acreage, and total value of crops in Madera County in 1991 and 1992. Figure 6-4 illustrates Madera County's crop production according to total production value.

WILLIAMSON ACT LAND

The California Land Conservation Act, better known as the Williamson Act, was enacted by the State Legislature in 1965 to encourage the preservation of agricultural lands. Under the provisions of the act, land owners agreeing to keep their lands under agricultural production for a minimum of 10 years receive property tax adjustments. Williamson Act lands are assessed based on their agricultural value, rather than their potential market value under nonagricultural uses. As depicted in Figure 6-5, most of the land devoted to agricultural uses in Madera County is under Williamson Act contract. In 1992, there were 3,870 parcels under agricultural preserve contract in Madera County, totalling 534,463 acres.

The amount of land protected by Williamson Act contract has been declining in recent years because of the non-renewal of contracts. Once a notice of nonrenewal has been filed by a landowner, contract restrictions on the use of the land are removed following a 10-year nonrenewal period. In 1992, 143 parcels covering 23,772 acres were in nonrenewal. Nonrenewal of contracts is most prevalent in those areas experiencing development pressures, such as the Highway 41 and Highway 99 corridors.

TABLE 6-2

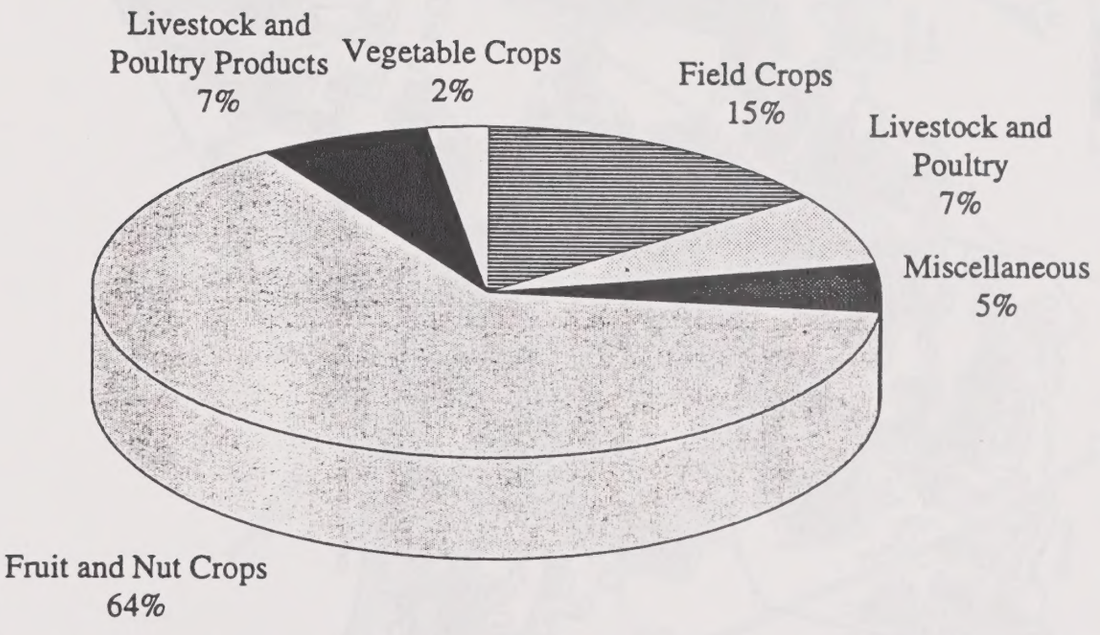
AGRICULTURAL ACREAGE, PRODUCTION, AND VALUE
Madera County
1991-1992

	Harvested Acreage (Acres, except where noted)		Total Production (Tons, except where noted*)		Total Value (Thousand Dollars)	
	1991	1992	1991	1992	1991	1992
Fruit and Nut Crops						
Almonds	38,000	38,258	26,220	32,137	$ 60,044	$ 79,378
Almond Hulls	xx	xx	52,440	64,274	3,304	3,599
Apples**	2,100	2,100	23,940	27,510	12,688	12,389
Figs	6,331	6,314	9,497	8,208	11,396	11,861
Grapes, Raisin	40,515	41,082	xx	xx	84,843	93,547
Grapes, Wine	37,470	38,795	xx	xx	53,023	82,767
Grapes, Table	2,386	2,098	16,106	16,364	12,482	12,273
Nectarines	787	832	5,273	8,320	3,100	4,576
Oranges	4,148	4,148	3,733	60,561	1,781	23,013
Olives	1,984	1,786	5,555	12,788	3,822	8,568
Peaches, Free	1,249	1,249	10,617	12,178	5,733	5,762
Pistachios	16,644	16,884	6,990	19,585	18,455	45,437
Plums	1,215	1,254	6,476	8,527	3,057	3,155
Walnuts	1,830	1,374	2,745	1,924	3,020	2,308
Misc.	2,262	2,280	xx	xx	5,959	9,729
Subtotal	**156,921**	**158,454**			**$282,707**	**$398,353**
Field Crops						
Barley, Irrigated	2,000	3,000	3,800	5,400	437	583
Beans, Dry	2,000	1,050	1,900	1,092	1,017	481
Cotton, Lint	51,100	48,100	119,778 *	128,427 *bales	43,719	44,307
Cotton, Seed	xx	xx	48,200	53,500	6,748	7,493
Corn, Field	7,400	8,200	31,820	36,080	4,391	4,221
Corn, Silage	3,800	4,000	99,180	99,180	1,785	1,736
Hay, Alfalfa	32,500	31,000	243,750	244,900	44,307	21,306
Hay, Grain	2,600	2,480	7,202	6,572	519	506
Pasture, Irrigated	14,000	14,000	xx	xx	1,750	1,680
Pasture, Other	400,000	400,000	xx	xx	2,400	3,200
Silage, Other	1,800	1,150	26,460	14,260	463	200
Stubble	26,000	25,000	xx	xx	403	388
Sugar Beets	902	740	33,284	25,234	1,154	833
Wheat	17,500	21,50	47,250	55,900	5,859	6,484
Misc.	8,540	6,240	xx	xx	1,704	1,140
Subtotal	**570,142**	**566,460**			**$93,068**	**$94,558**
Seed Crops	2,550	4,750	xx	xx	$ 1,026	$ 1,669
Vegetable Crops	5,372	6,686	xx	xx	$ 16,024	$ 13,952

Continued

FIGURE 6-4

MADERA COUNTY AGRICULTURAL CROP VALUE
1992



Source: Madera County Agricultural Commissioner, 1992

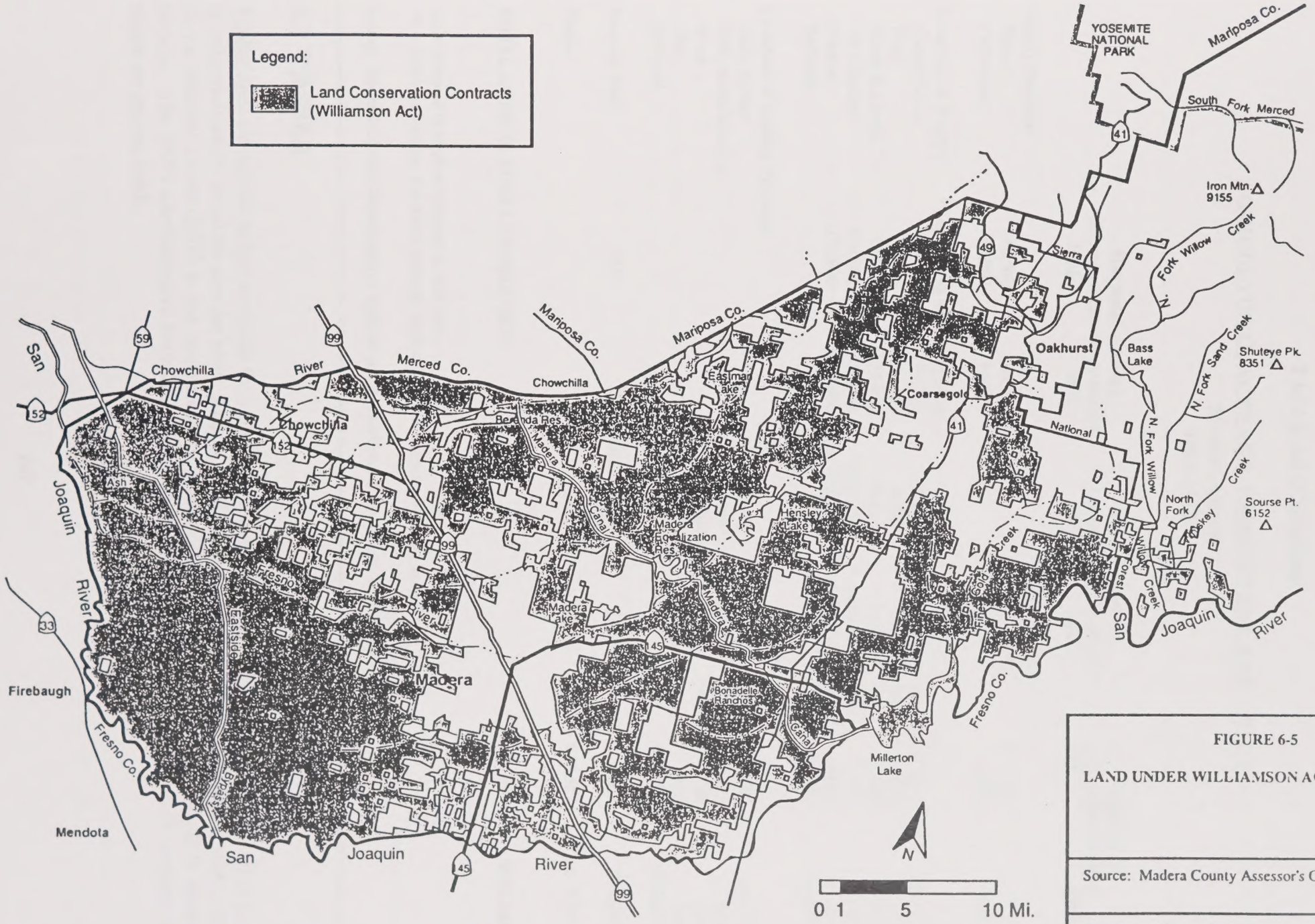


FIGURE 6-5

LAND UNDER WILLIAMSON ACT CONTRACT

Source: Madera County Assessor's Office, 1991

Maps Prepared 8/93 by: H. T. Harvey & Associates

TABLE 6-2 (Continued)

AGRICULTURAL ACREAGE, PRODUCTION, AND VALUE
Madera County
1991-1992

	Harvested Acreage (Acres, except where noted)		Total Production (Tons, except where noted*)			Total Value (Thousand Dollars)	
	1991	1992	1991	1992		1991	1992
Apiary Products							
Honey	240,000	240,000				$ 120	$ 132
Pollination	96,000	96,000				2,880	3,072
Livestock & Poultry	*Reported by number of head						
Cattle/Calves	40,000	44,000	262,000*	288,200	*cwt	$18,864	$21,471
Hogs	1,700	1,400	4,250*	3,220	*cwt	248	152
Sheep & Lambs	22,200	25,400	24,420*	27,940	*cwt	1,468	1,757
All Chickens	626,000	1,000,000	2,818,000*	5,000,000	*lbs	871	1,525
Turkeys	2,373,900	2,411,000	51,030,620*	48,463,000	*lbs	19,647	17,011
Subtotal						**$41,098**	**$41,916**
Livestock & Poultry Products							
Milk, market			3,486,464*	3,570,784	*cwt	38,944	41,457
Milk, manufacturing			44,485*	57,990	*cwt	469	634
Wool			177,600*	203,200	*lbs	99	159
Misc.			xx	xx		982	984
Subtotal						**$40,494**	**$43,234**
Nursery Stock	365*	360	*field acres			$ 4,567	$ 4,294
Timber			41,600*	41,600	*mbf	$ 4,567	$ 4,294
TOTAL AGRICULTURAL PRODUCTION						**$483,991**	**$607,543**

xx = counted in another category in this table
** = Total production and value includes apples harvested from non-bearing acreage

Source: Madera County Department of Agriculture, *Agricultural Crop Report*, 1992

6.3 TIMBER

Timberlands are defined as land available for timber production and capable of growing at least 20 cubic feet of industrial-quality wood per acre per year. Almost all of the timberlands in Madera County lie within the Sierra National Forest (SNF) in the eastern county, which falls under the jurisdiction of the U.S. Forest Service. The SNF's administrative boundary encompasses 1,395,553 acres, 109,493 acres (8 percent) of which are private lands.

The SNF contains a total of approximately 563,000 acres of forested land in the SNF, containing four major types of vegetation. Ponderosa Pine is the dominant vegetation occurring between 3,000 and 5,000 feet in elevation. Mixed conifers (including Ponderosa Pine, Jeffrey Pine, Sugar Pine, White Fir, and Incense Cedar) occur in the mid-elevation zone, at approximately 4,000 to 6000 feet. Red Fir is dominant between approximately 7,000 and 9,000 feet. Subalpine forest occurs above 9,000 feet. Hardwood-grassland constitutes a fifth type of vegetation which occurs below 2,500 feet, and occasionally yields fuelwood harvest. A discussion of vegetation is included in the *Biological Resources* section of this chapter.

The U.S. Forest Service's *Forest Land and Resource Management Plan* for the Sierra National Forest, adopted in 1991, provides for the long-term management of the forest by prescribing various uses and conservation measures for the forest land. Management prescriptions include recreation uses; preserving visual resources, wilderness areas, wildlife and fishery resources, sensitive plants, riparian corridors, biodiversity, soils, water, mineral resources, and cultural resources; timber harvesting; and hydroelectric development.

TIMBER-RELATED EMPLOYMENT AND REVENUE

In 1992, timber ranked 18th in crop value in Madera County, with a total value of $6,363,000. Many related industries in the county rely on timber for their operation; thus the economic importance of timber in Madera County is greater than simply its crop value. Recent federal cutbacks in the allowable quantity of timber harvested may potentially have a great effect on the economy of the county. The Sierra National Forest *Land and Resource Management Plan* reduces the allowed annual allowable sale quantity (ASQ) from over 125 MMBF to 88 MMBF, which amounts to approximately a 30 percent reduction. Reduction of production targets is partially a result of a shift in emphasis toward other forest resources. According to the *Forest Plan EIR*, this reduction will likely result in the closure of the mill in the community of North Fork (Sequoia Forest Industries), which employs approximately 50 people. There is another mill in the county, in the city of Madera (Norby Lumber Company), which will not be similarly affected, due to its more competitive location within the Central Valley transportation network.

REGULATION OF TIMBER PRODUCTION

Timber production is regulated and approved by various agencies. Counties zone private land for timber production, the state approves timber harvest plans on private land, and the U.S. Forest Service leases federal land for timber harvesting. This section discusses timber production regulations applicable in Madera County.

Timberland Production Zoning

The *California Forest Taxation Reform Act* of 1976 created Timberland Preserve Zoning (TPZ) as a measure to reduce property taxes and protect timberlands from encroachment into incompatible land uses. Primary responsibility for TPZ administration, which includes the selection of timberlands for the zone, the establishment of minimum parcel size, and the determination of compatible uses, is delegated to county governments. Pursuant to this legislation, Madera County enacted a Timber Preserve Zoning ordinance. The 1976 Act was amended and replaced by the *Timberland Productivity Act* of 1982; however, applicable zones in Madera County are still called Timber "Preserve" Zones.

Timberland Preserve Zoning is a method of preserving forest resources through reduced property taxes. According to the Act, cities and counties with qualifying lands must adopt timberland production zoning as a means of restricting use of the land to timber production and other compatible open space uses which

protect wildlife and fisheries, watersheds, and recreational uses. The Act also regulates timber production on private land. Since most of the forest land in Madera County is in the SNF, and thus under federal jurisdiction, Timber Preserve Zoning is applied primarily in private inholdings within the SNF boundaries.

Timber Harvest Plans

The *Z'berg-Nejedly Forest Practice Act* was incorporated into the *California Public Resources Code* in 1973 with the intention of correcting deficiencies in the original *Forest Practice Act* of 1945 and providing the statutory authority for regulating timber harvesting on non-federal lands. The *Forest Practice Act* established the Board of Forestry and District Technical Advisory Committees for the purpose of formulating Forest Practice Rules. The Act delegates authority for timber harvest plan review and enforcement of Forest Practice Rules to the California Department of Forestry and Fire Protection (CDF).

Pursuant to the Forest Practice Rules, a timber harvest plan is required for harvesting of timber for commercial purposes on parcels three acres or larger. Timber harvest plans must be prepared by Registered Professional Foresters and submitted to CDF for consideration. In evaluating timber harvest plans, CDF conducts a feasibility analysis of the proposed operation considering the economic and environmental implications of alternative timber harvesting methods.

A total of 13 timber harvest plans in Madera County have been approved by CDF since 1990, covering 1,689 acres of timberland. Since timber harvest plans are valid for three years, this is the total amount of private land in the county used for timber production as of August 1993.

U.S. Forest Service Leases

Most of the timber production in the county takes places in the Sierra National Forest; timber operators lease land from the U.S. Forest Service, and a portion of this revenue is returned to Madera County as property tax. Timber production in the Sierra National Forest is governed by the *Sierra National Forest Land and Resource Management Plan*, rather than the *Forest Practice Act*.

6.4 MINERAL RESOURCES

Extracted mineral resources in Madera County include aggregate (sand, gravel, and crushed stone), asbestos, copper, gold, iron, and silver. The most significant resource in terms of abundance, demand, and economic value, is aggregate. Sand, gravel, and crushed stone are building materials, and constitute crucial resources in a developing region.

SURFACE MINING AND RECLAMATION ACT

The Surface Mining and Reclamation Act (SMARA) was enacted by the State Legislature in 1975 to ensure a continuing supply of mineral resources for the state, as well as to provide for the mitigation of adverse impacts associated with mining operations. SMARA requires cities and counties to adopt ordinances for the issuance of permits for surface mining operations, and for the review and approval of reclamation plans (*Public Resources Code* Section 2774). Approval of permits is conditioned upon the adoption of a reclamation plan. Local mining ordinances must be approved by the State Mining and Geology Board.

Mineral Resource Zones

SMARA also contains provisions for the inventory of mineral lands in California. In accordance with the State Board's *Guidelines for Classification and Designation of Mineral Lands*, the State Geologist must classify mineral areas as one of four Mineral Resource Zones (MRZ) or a Scientific Zone (SZ). The zone designations are as follows:

- **MRZ-1:** Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence.
- **MRZ-2**: Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- **MRZ-3**: Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- **MRZ-4**: Areas where available information is inadequate for assignment to any other MRZ zone.
- **SZ**: Areas containing unique or rare occurrences of rocks, minerals, or fossils that are of outstanding scientific significance shall be classified in this zone.

The State Division of Mines and Geology (DMG) classifies the mineral lands in the Fresno Production-Consumption (PC) region, which includes part of Madera County and the City and County of Fresno, in *Special Bulletin 158*. Production-Consumption region boundaries are set by DMG upon determination of the boundaries of the market area of active aggregate operations. Madera County contains aggregate resources along the San Joaquin River, approximately between Friant Dam and the Santa Fe Railroad. Areas along the river are classified as either MRZ-1 or MRZ-2 (see Figure 6-6); approximately 2,350 acres of San Joaquin River bottom land (in both Fresno and Madera Counties) is classified as MRZ-2. Most of the land in these zones not currently permitted for mining operations is under private ownership.

CURRENT EXTRACTION OPERATIONS

Madera County has a rich history of mineral extraction, including gold, copper, and granite. Gold extraction in the county is now strictly recreational (gold panning), although gold is occasionally extracted as a by-product in other mineral extraction operations; and copper mining is no longer commercially viable. Three types of minerals are currently commercially mined in Madera County: stone (subbase), dimension stone (granitic), and aggregate. These operations are described below.

Aggregate (Sand, Gravel, and Decomposed Granite)

Aggregate material is an important resource in areas experiencing urban growth. Over 90 percent of the state's production of sand and gravel is used for construction and road building. Sand, gravel, and crushed stone are building materials used in Portland cement concrete (PCC), asphaltic concrete, stucco, and plaster, as well as road base, subbase, and railroad ballast. The material specifications used for making PCC are more restrictive than for other types of aggregate products; thus, deposits acceptable for use in PCC are scarce and valuable. Because of its importance in construction, its versatility, and its relative scarcity, PCC-grade deposits are of primary concern when managing aggregate resources for future use.

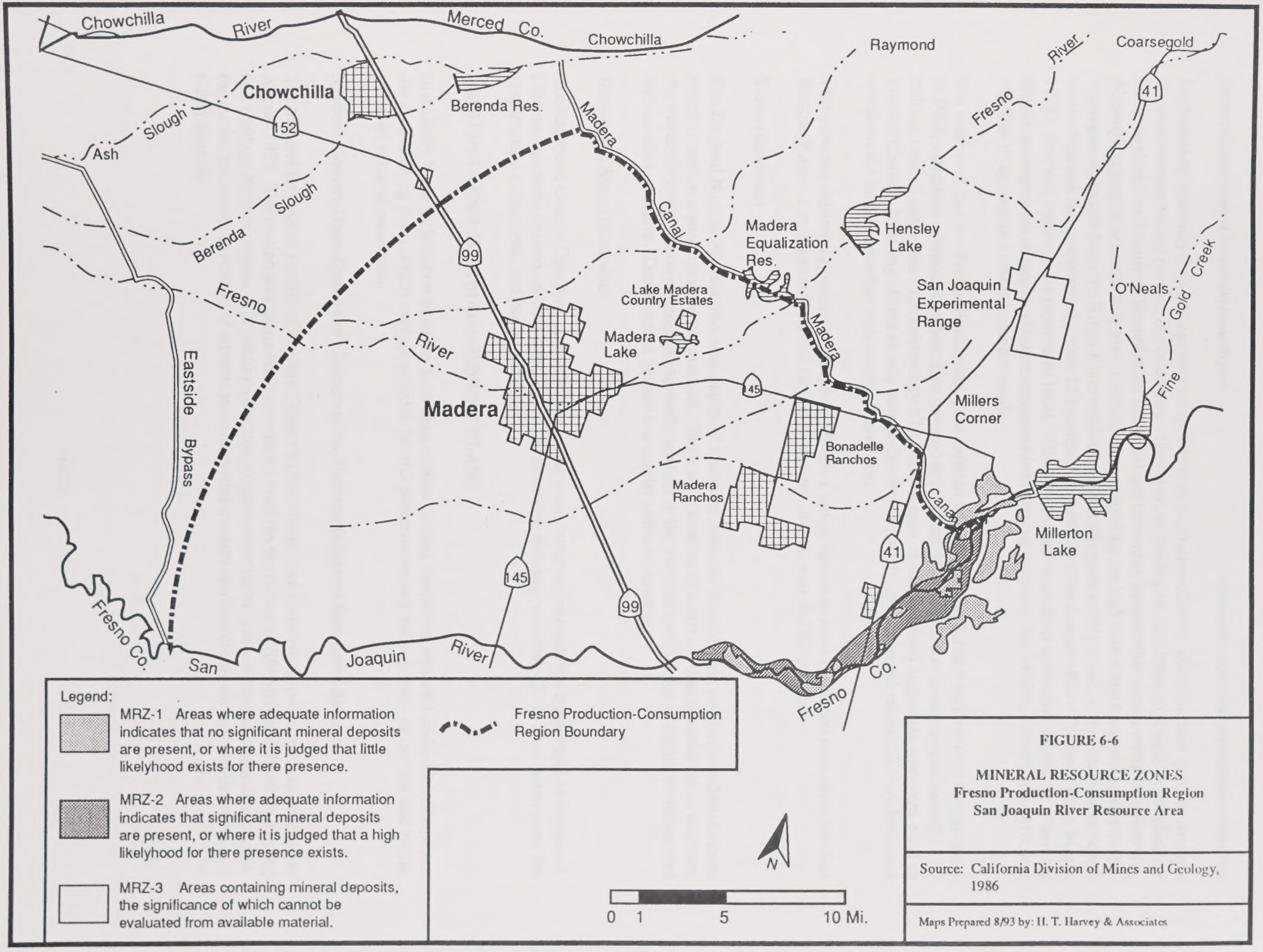


FIGURE 6-6

MINERAL RESOURCE ZONES
Fresno Production-Consumption Region
San Joaquin River Resource Area

Source: California Division of Mines and Geology, 1986

Maps Prepared 8/93 by: H. T. Harvey & Associates

High-quality, relatively low-cost aggregate deposits exist in Madera County along the San Joaquin River in the southeastern valley portion of the county. However, as the region continues to urbanize, supplies are being depleted, and many of the potential resources are becoming inaccessible due to urban development. Although aggregate is a relatively low-cost material, transporting the high bulk weight material is very costly. Aggregate materials from the Kings River or Coalinga, the alternate supply areas, would increase the costs of development by approximately 50 to 120 percent, respectively (*San Joaquin River Parkway Plan*, March 1992). For this reason, the existence of local, "close-to-market" extraction operations is critical. Planning for the management of potential future resources is crucial to ensuring that Madera County has sufficient supplies of aggregate to meet its future needs.

It is estimated that the Fresno Production-Consumption region contains 2,169.5 million tons of aggregate. In 1984, extraction operations in the region covered approximately 3.5 miles containing approximately 119.3 million tons of aggregate. Approximately 57.1 million tons of undeveloped aggregate resources exist in Madera County. Planning efforts should emphasize protection of these untapped resources from land uses which would be incompatible with mining operations.

There are two existing aggregate producers in Madera County, operating three extraction sites along the San Joaquin River: San Joaquin Sand and Gravel Company, and Stewart and Nuss, Inc.

Stone (Subbase)

The Gaylord Borrow Pit, near the community of Oakhurst, extracts decomposed granite, or subbase stone, which is used as a road construction material. There are a number of materials that are used for as subbase; the material used must meet detailed standards relating to the material's ability for adequate drainage, and withstanding pressure. Decomposed granite is a quality subbase material.

Dimension Stone (Granitic)

The Raymond Granite Company operates a dimension stone extraction site near the community of Raymond. Dimension stone is used as both structural and decorative building material. It is most often used for constructing monuments and public buildings.

EXISTING RESOURCE MANAGEMENT PLANS

In addition to the reclamation plans for individual surface mining operations required under SMARA, there are two existing plans which contain policies for the preservation and management of current and future potential mineral resources.

Madera County Open Space and Conservation Element (Mineral Resources Section)

The Mineral Resources section of Madera County's *Open Space and Conservation Element* was adopted in August 1987. The section was prepared in accordance with the provisions of SMARA and the State Mining and Geology Board's criteria. The section provides policies ensuring the preservation of mineral resources, the minimization or prevention of adverse environmental impacts, and the elimination of public health and safety hazards.

The following is a summary of the policies contained in the Mineral Resources Section:

- Mineral extraction policies shall be coordinated with the city and county of Fresno.
- MRZ-2 areas shall be zoned Open Space (OS); Public Open Space (POS); and Agricultural, Rural, Exclusive-20 and -40 (ARE-20 and ARE-40).
- Incompatible land uses shall not be permitted within the "impact areas" of significant aggregate deposits, nor within the MRZ-2 areas themselves.
- All surface mining operations are subject to a conditional use permit; applications shall at minimum contain a mining plan and a reclamation plan.

San Joaquin River Parkway Plan

The *San Joaquin River Parkway Plan* was adopted in March 1992 by the San Joaquin River Parkway Task Force, an advisory body created by state statute in 1990. The *Plan* is intended to be a conceptual, advisory document, the purpose of which is to indicate possible land uses for 5,900 acres along a stretch of the San Joaquin River between Friant Dam and the Highway 99 crossing, as well as the existing 17-acre Skaggs Bridge Regional Park at the Highway 145 crossing. Approximately 1,900 acres of this land is located in Madera County; the remainder is in Fresno County to the south.

Overall goals of the *Plan* are listed in the Land Use chapter of this report. The *Plan* includes a Mineral Resource Element, the goals of which are as follows:

- Assure that the reclamation of land after removal of sand and gravel deposits is planned for in ways that will enhance or complement the parkway and its natural resources and recreational opportunities.
- Assure that the facilities are designed, constructed, and operated in such a way that sand and gravel mining operations are not adversely affected and that they will not preclude future extraction in all MRZ-2 designated areas.

Specific objectives deal with the economic importance of sand and gravel deposits to the Fresno-Madera region and the development of specific reclamation standards that allow for ecological goals and the need for public open space to be met.

6.5 WATER RESOURCES

Water is a precious and limited resource in Madera County. Although there are many rivers, streams, creeks, and reservoirs throughout the county, the supply of water is highly dependent upon rain and snow precipitation. Given that precipitation in the county and the region varies greatly from year to year, water supply in the county is subject to frequent fluctuations. Periods with several consecutive years of drought are not uncommon, and illustrate the urgency of long-term water resource management. Unless the county's water resources are carefully managed, there will not be sufficient supply to meet future growth requirements. Mismanagement could also result in serious degradation of the quality of the county's water resources.

Management considerations must take into account the situational differences between the valley and mountain areas. Water users in the valley consist of growers, and commercial, industrial and residential users, whereas the eastern portion of the county contains mainly residential users. The western valley portion of

the county relies on both surface and groundwater to meet demand, experiences fairly low amounts of precipitation, and has fairly predictable groundwater supplies. Agriculture uses both surface and groundwater while municipal users rely completely on groundwater supplies. Users in the eastern county areas rely primarily on well water, which is problematic because groundwater is limited to open fractures in the underlying rock and it is difficult to locate adequate supplies. These water-carrying fractures are not always interconnected, and often contain only a limited supply of water. The eastern county also experiences much higher levels of precipitation than the western county (four to five times as high, on average).

In addition to these considerations, the natural uses of water -- as habitat, recreational amenity, and aquifer recharge -- must be carefully managed.

MAJOR HYDROLOGICAL FEATURES

Madera County lies entirely within the San Joaquin River hydrological basin or watershed, the boundaries of which are formed by the ridge lines of the Sierra Nevada, the Tehachapi, and the Coast Ranges. The most prominent hydrological features in the county are the San Joaquin, Fresno, and Chowchilla Rivers; large reservoirs including Eastman, Hensley, Millerton, and Bass Lakes and Mammoth Pool; and the Madera Canal. There are also numerous smaller creeks, streams, and lakes in the county, particularly in the mountain areas. In addition, there are several dams of various types and uses throughout the county. This section discusses the major water features.

San Joaquin River: The San Joaquin River forms the southern and western borders of Madera County. Originating in the high Sierras, southwest of Yosemite National Park, it serves as the principal drainage system for the San Joaquin Valley. Most of the other rivers and creeks in the valley are tributaries of the San Joaquin. The river is impounded at Friant Dam in Fresno County, forming Millerton Lake, which lies partially in Madera County. From this point, most of the water is diverted into the Madera and Friant-Kern Canals, and the remainder is released into the river below the dam.

Fresno River: The Fresno River is a tributary of the San Joaquin River, and runs from the eastern portion of the county in the Sierra Nevadas, through the city of Madera, joining the San Joaquin River near the northwestern corner of the county. Its elevation ranges between approximately 7,100 feet at its headwaters, to approximately 100 feet at its lowest point in the valley. Cottonwood Creek, which is connected to the Fresno River near its intersection with the Madera Canal, serves as a distributary of the river's waters during flood flows.

Chowchilla River: Also a tributary of the San Joaquin River, the Chowchilla River originates in Mariposa County to the north, and forms a portion of Madera County's northwestern border, running parallel to the Fresno River. Its elevation ranges from approximately 6,800 feet at its headwaters to approximately 100 feet at its lowest point. Ash and Berenda Sloughs serve as distributaries for its flood waters.

Merced River: Only a short portion of the Merced River runs through Madera County, with the majority lying in Mariposa and Merced Counties. The stretches lying within Madera County (portions of its south and main forks) are above 5,100 feet.

Hidden Dam/Hensley Lake: Hidden Dam impounds the Fresno River at Hensley Lake approximately 12 miles northeast of the city of Madera. The facility was built in 1975 by the U.S. Army Corps of Engineers to provide for irrigation and flood control. Hensley Lake also serves as a recreational facility.

Buchanan Dam/Eastman Lake: Buchanan Dam impounds the Chowchilla River at Eastman Lake approximately 17 miles northeast of the city of Chowchilla. This facility was also built in 1975 by the Corps of Engineers for irrigation and flood control purposes, and also serves as a recreation area.

Millerton Lake: Millerton Lake is formed by Friant Dam in Fresno County on the San Joaquin River. The lake lies partially in Fresno County and partially in Madera County. Friant Dam was built by the U.S. Bureau of Reclamation (USBR) in 1942 as a flood control and irrigation project, and a component of the Bureau's Central Valley Project (CVP). The facility also serves as a recreational area.

Bass Lake: Bass Lake lies on the North Fork of Willow Creek, in the Sierra National Forest, and is operated by Pacific Gas & Electric for hydroelectric power generation, and some water is also used for irrigation. The lake is also used for recreation, and has a resort community centered around it.

Mammoth Pool Reservoir: Mammoth Pool Reservoir, built in 1960, is owned and operated by Southern California Edison Co. for hydroelectric power generation. The reservoir also serves recreational needs.

Madera Canal: The Madera Canal is a component of the CVP, and is managed by the Madera Irrigation District (MID) for the conveyance of CVP water from Millerton Lake to agricultural users. The canal is located west of the cities of Madera and Chowchilla, approximately at the valley's edge. The Madera Equalization Reservoir lies along the canal, and is essentially a portion of the canal itself where water flow is regulated.

Table 6-3 lists the storage and uses of the major reservoirs, lakes and rivers in Madera County. The data was recorded in 1990-1991; it should be noted that the data on reservoir storage was gathered during the height of the recent drought, and 1993 storage levels are much higher, due to higher precipitation levels. "ND" indicates that there is no current available data. Table 6-4 depicts the drainage area and annual flows of the major rivers in the county. Currently, there are no gauging stations along the Fresno and Chowchilla Rivers, so no data is provided for flow or annual discharge along these rivers.

TABLE 6-3

MAJOR RESERVOIRS IN MADERA COUNTY
1991

Reservoir	Location	Storage Capacity (Acre-feet)	Use
Millerton	San Joaquin River	520,000	Fld/Irr/Rec
Eastman	Chowchilla River	150,000	Fld/Irr/Rec
Hensley	Fresno River	90,000	Fld/Irr/Rec
Bass Lake	N. Fork Willow Creek	45,410	Pwr/Rec/Irr
Mammoth Pool	San Joaquin River	119,000	Pwr/Rec

Fld = flood
Irr = irrigation
Rec = recreation
Pwr = hydroelectric power

Source: U.S. Geological Survey, 1992

TABLE 6-4

ANNUAL FLOWS OF MAJOR RIVERS IN MADERA COUNTY
1991

River	Drainage Area (square miles)	Flow (cfs)	Annual Discharge (Acre-feet)
San Joaquin			
Above Willow Creek	1,295	446[a]	323,100[a]
Above Shakeflat Creek	1,003	88[b]	ND
At Miller Crossing	249	601[c]	435,400[c]
Fresno			
Below Hidden Dam	237	ND	ND
Near Knowles	133	ND	ND
Chowchilla			
Below Buchanan Dam	236	ND	ND
Above Willow Creek	173	ND	ND

ND = not determined

cfs = cubic feet per second

[a] 40-year average
[b] maximum flow 1990-1991
[c] 47-year average

Source: U.S. Geological Survey, 1992

SURFACE WATER SUPPLY

The county's surface water supply is derived from rainfall and snowmelt runoff into waterways within the county. Ninety percent of precipitation in the San Joaquin basin falls between November and April, and most of this is snow. Precipitation levels vary from an average of 50 inches per year in the mountain areas, to only 10 inches per year in the valley. Existing surface water rights in the county belong to agricultural users; agricultural water is obtained from Hensley, Eastman, and Millerton Reservoirs. Surface water is currently not used for municipal water supply except for the Bass Lake community.

Irrigation Districts

Surface water in the county is managed by four irrigation districts within the county that manage delivery of water to agricultural users. Madera Irrigation District (MID) is the main surface water supplier in the

county, covering the most acreage (approximately 129,000 acres) and managing the Madera Canal for the U.S. Bureau of Reclamation. Chowchilla Water District (CWD) also supplies water to a substantial amount of acreage within the county, and to some areas in Merced County to the north (the district covered approximately 79,000 acres in 1991). The Chowchilla Water District uses water from the Central Valley Project's Millerton Lake at Friant Dam, as well as Buchanan Reservoir on the Chowchilla River. In addition to the two major agencies, Gravely Ford and Clayton Water Districts also operate in the county, although they cover much smaller areas and only have rights to excess supply in the wet years; these are essentially inactive agencies.

In 1993, both MID and CWD were able to fully meet demand for water, largely because 1993 has been wetter than the typical year in the Central Valley. Years of drought, as well as legislation affecting the delivery of water, such as the Federal and State Endangered Species Acts, the pending Bay-Delta water quality plan (mandated by the Federal Clean Water Act), and the recent CVP Improvement Act (part of the Reclamation Projects Authorization and Adjustment Act, 1992) will force cutbacks in water deliveries and increase costs for available supplies. Each of these Acts provides for more water to be retained to preserve fish and wildlife habitat.

Central Valley Project Improvement Act

The *Central Valley Project Improvement Act*, signed into law by Congress in 1992, could increase costs and reduce supplies of surface water to agricultural users in Madera County. Agricultural users in Madera County with water rights could also be permitted to sell their surface water to users outside the county, which could reduce the total water supply in Madera County and increase the use of groundwater. Salient features of the *Act* are as follows:

- A three-tiered pricing system is established for water deliveries to agriculture -- growers will pay normal contract rates for the first 80 percent of supply, and full cost for the top 10 percent of supply. The middle tier of supply will be priced halfway between the top and bottom tiers.

- A set amount of water is reserved for fish and wildlife habitat restoration, to be financed by a portion of the price increases.

- Voluntary transfers of water, for profit, by CVP contract holders to areas outside the service area will be allowed.

- Contract lengths will be 25 years, as opposed to 40 under the original legislation.

This legislation alone has the potential to drastically affect the agricultural community, increasing costs and limiting supplies. Its combined effect with existing water legislation which reserves more water for environmental purposes and future droughts, could have even greater severity.

GROUNDWATER SUPPLY

The San Joaquin Valley contains two primary hydrologic basins, the boundaries of which have been agreed upon by the United States Geological Survey (USGS), the State Department of Water Resources (DWR), and the State Water Resources Control Board (SWRCB). Madera County lies within the San Joaquin Basin, which encompasses the northern third of the San Joaquin Valley. This basin has been]further divided by the DWR into Detailed Analysis Units (DAUs), which are determined using both political (local water agency) and hydrological (similarities in supply and use) parameters. There are three DAUs in Madera

County: one which encompasses the western portion of the valley, one which covers the central portion, and one covering the eastern portion.

Ground water levels in all three DAUs have been decreasing steadily for many years, with some recovery in the wetter years. Figure 6-7 shows groundwater depths in 1960 and Figure 6-8 shows groundwater depths in 1990. From 1960 to 1990, the water table in the county has dropped between 10 and 120 feet (see Figure 6-9). Figure 6-10 shows areas of severe water table depression in 1990.

In some areas, the water table has dropped an average of two or more feet per year over the past 30 years. The eastern valley basin, which includes some of the foothill area of the county, is the most severely overdrafted basin in the county. While the other two basins show some recovery in wet years, the eastern basin does not exhibit the same trends. Countywide, groundwater levels will continue to decline, since groundwater pumping exceeds the rate of recharge, even during normal water years.

During average years, groundwater supplies approximately half of agricultural irrigation in Madera County; During dry years, this amount increases because groundwater is used to supplement reduced surface supplies. Some agricultural areas in the county, including the smaller water districts, rely completely on groundwater supply in the dry years. Municipal demand is also met solely with groundwater. The foothill and mountain areas, which are underlain by impervious bedrock, contain groundwater only in areas where water percolates through fractures in the rock. These areas use only groundwater, and supply is therefore limited and unpredictable.

Madera County faces two key issues in regard to groundwater supply. First, continued agricultural production will continue to lower the water table. Reduced surface supplies during dry years and the potential ability to sell water outside the county will exacerbate this situation. Secondly, groundwater in the foothills and mountains is very limited, and is not adequate to serve significant future growth. Water supply is therefore one of the most critical issues facing Madera County.

Aquifer Recharge Areas

The main source of aquifer recharge in the valley is artificial recharge, or the process of spreading water over an area (excess supply in wet years) and allowing it to percolate through the soil. Percolation of water which is applied to crops is the primary method of artificial recharge. The majority of this occurs in the central DWR-designated basin, in the midsection of the valley. Recharge also occurs in the other two basins to a lesser degree. In addition, the San Joaquin riverbed is a recharge area; high flows easily infiltrate the alluvial soils. The Fresno and Chowchilla riverbeds also contribute to ground water replenishment.

WATER QUALITY

Surface water quality in the county has exhibited no significant problems. However, since it is primarily used for agriculture, the standards applied to surface water in Madera County are not as strict as those for drinking water. Surface water typically requires treatment before it can be used as a drinking water supply.

Surface and groundwater quality in the county is monitored by a number of agencies, mainly for the purposes of ensuring safe drinking water. Groundwater used for irrigation is not monitored, and thus there have been no systematic, countywide studies of groundwater quality. Based on the available information, it appears that the county has no significant groundwater quality problems.

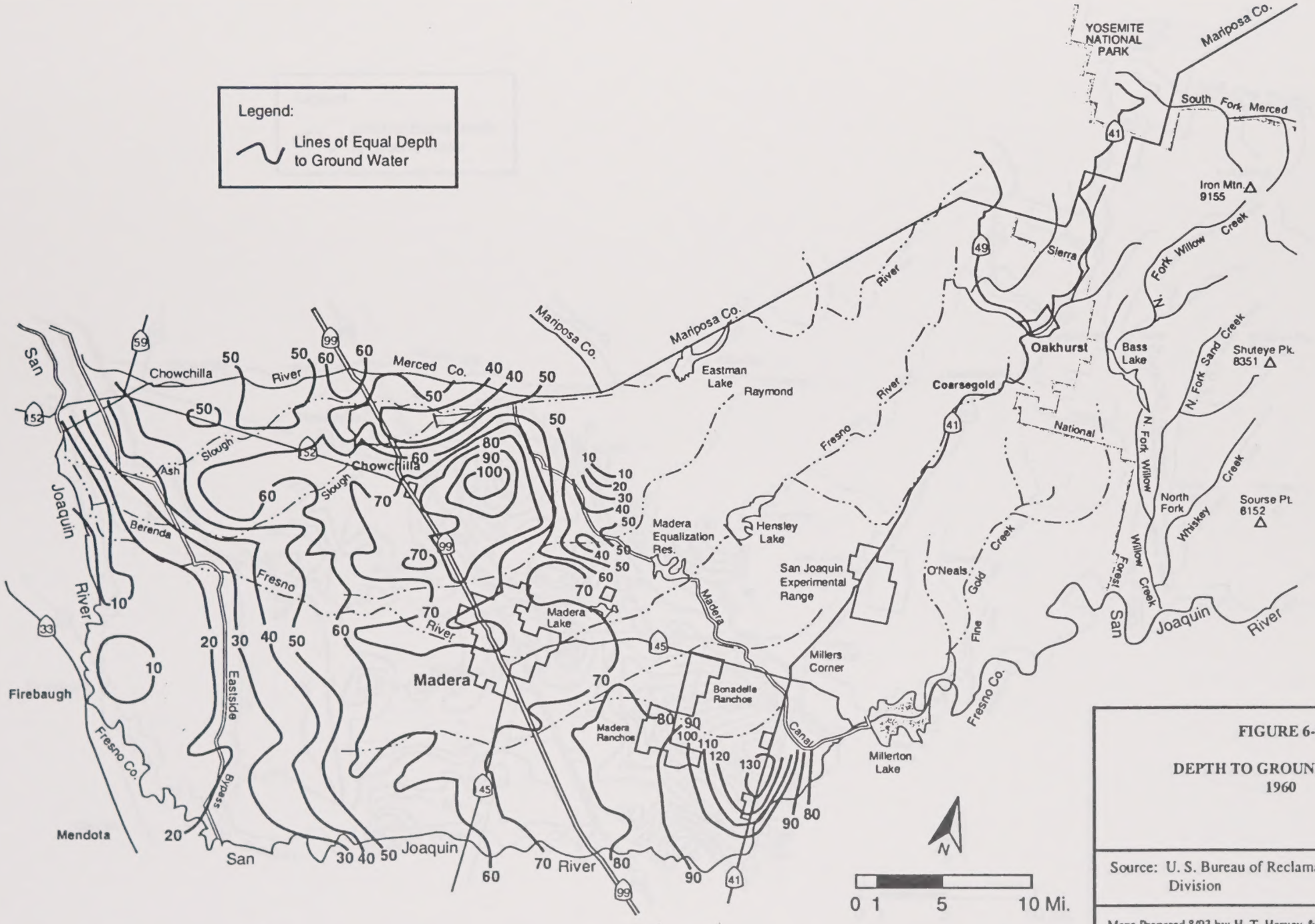


FIGURE 6-7

DEPTH TO GROUND WATER
1960

Source: U. S. Bureau of Reclamation, Fresno Field Division

Maps Prepared 8/93 by: H. T. Harvey & Associates

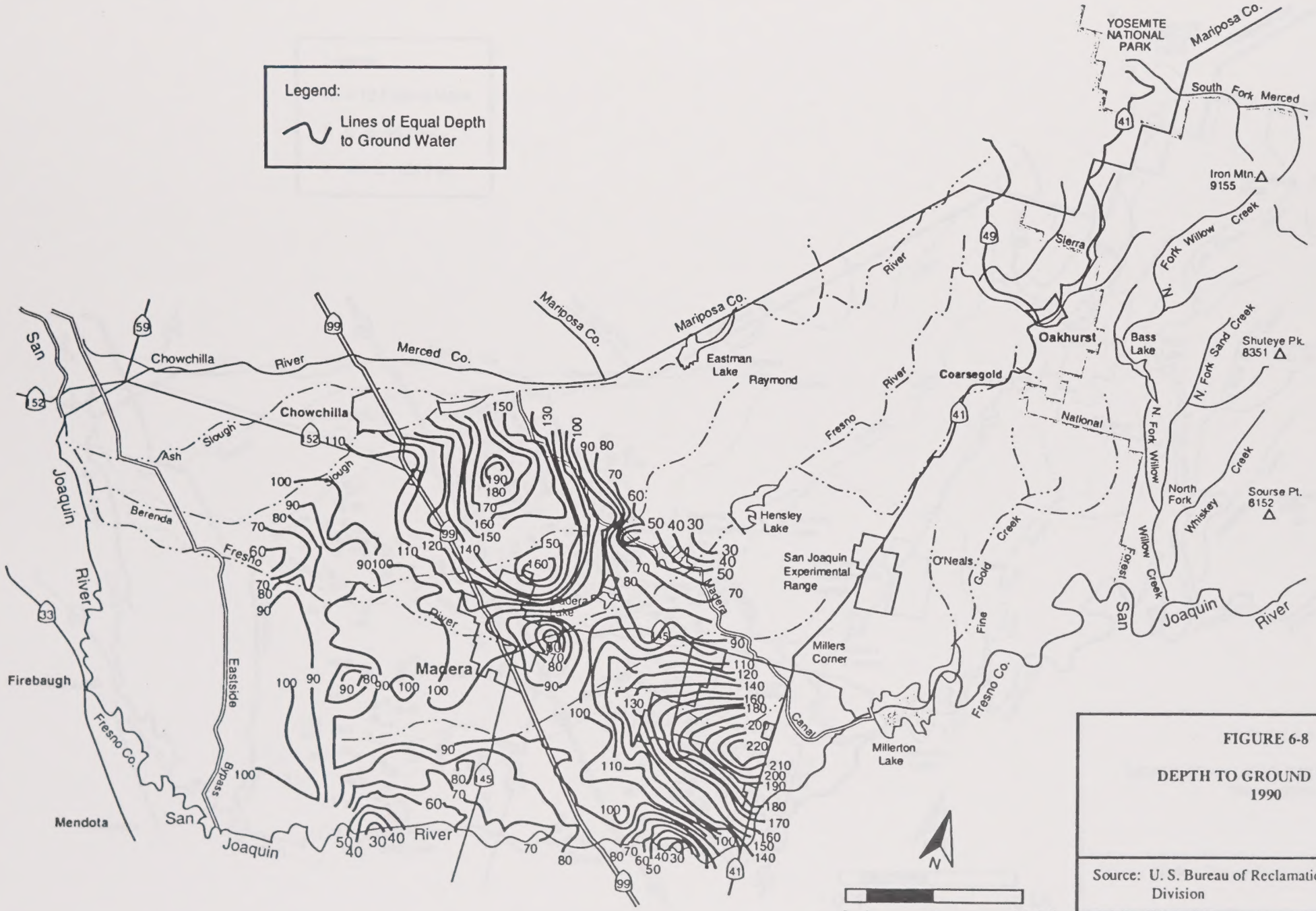
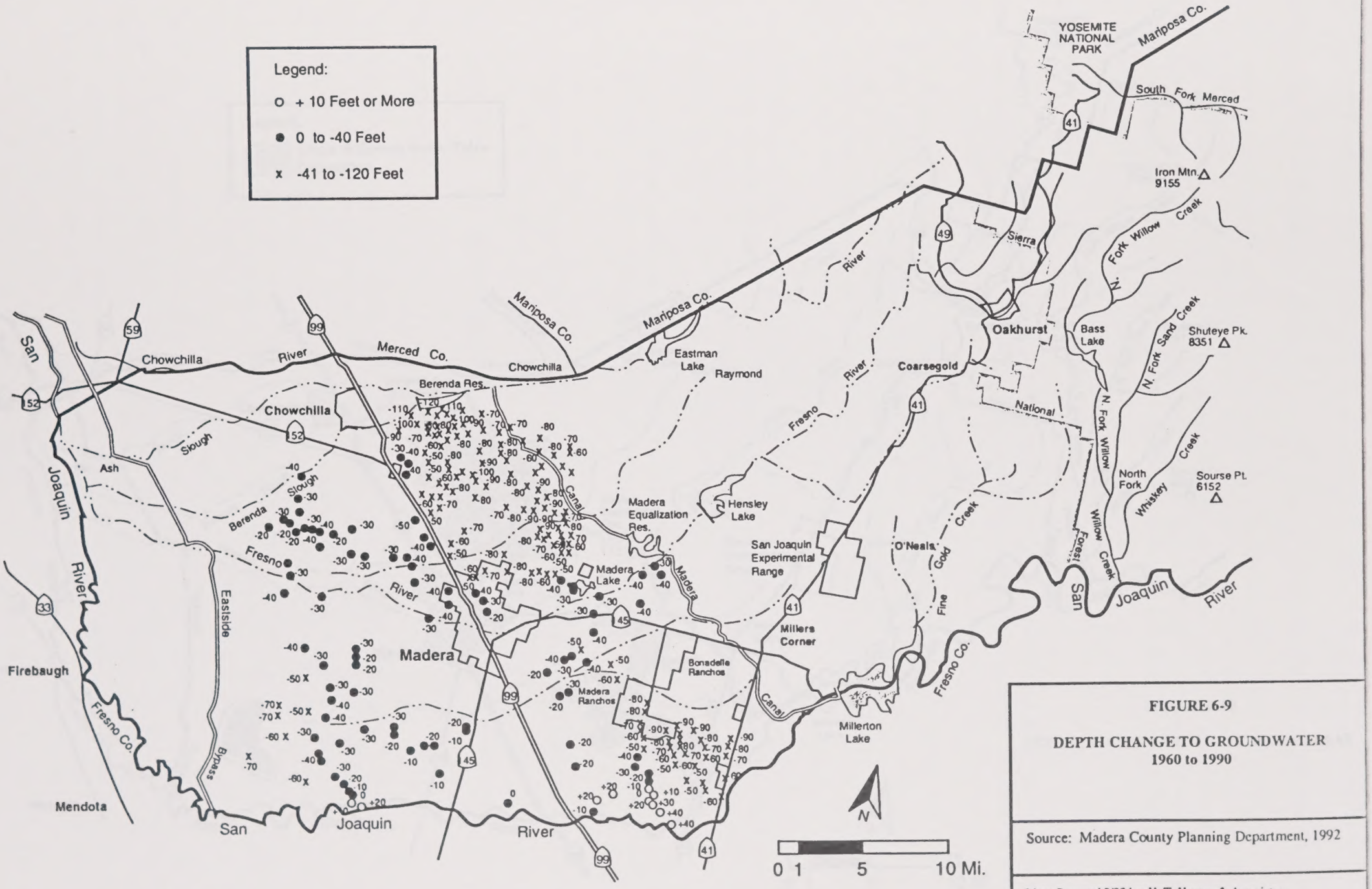


FIGURE 6-8

DEPTH TO GROUND WATER
1990

Source: U. S. Bureau of Reclamation, Fresno Field Division

Maps Prepared 8/93 by: H. T. Harvey & Associates


Legend:
o + 10 Feet or More
● 0 to -40 Feet
x -41 to -120 Feet
YOSEMITE NATIONAL PARK
Mariposa Co.
South Fork Merced
Iron Mtn. 9155
N. Fork Willow Creek
Sierra
Oakhurst
Bass Lake
Shuteye Pk. 8351
N. Fork Sand Creek
Coarsegold
National
N. Fork Willow
North Fork Whiskey Creek
Sourse Pt. 6152
Willow Creek
Forest
San Joaquin River
O'Neals
Gold Fine Creek
Fresno River
Eastman Lake
Raymond
Chowchilla River
Merced Co.
Chowchilla
Berenda Res.
Chowchilla
Slough
Ash
Berenda
Fresno
Madera Equalization Res.
Hensley Lake
Madera Canal
Madera Lake
San Joaquin Experimental Range
Millers Corner
Bonadelle Ranchos
Madera Ranchos
Madera
Eastside Bypass
Firebaugh
Fresno Co.
Mendota
San Joaquin River
Millerton Lake
Fresno Co.
N
0 1 5 10 Mi.
FIGURE 6-9
DEPTH CHANGE TO GROUNDWATER
1960 to 1990
Source: Madera County Planning Department, 1992
Maps Prepared 8/93 by: H. T. Harvey & Associates

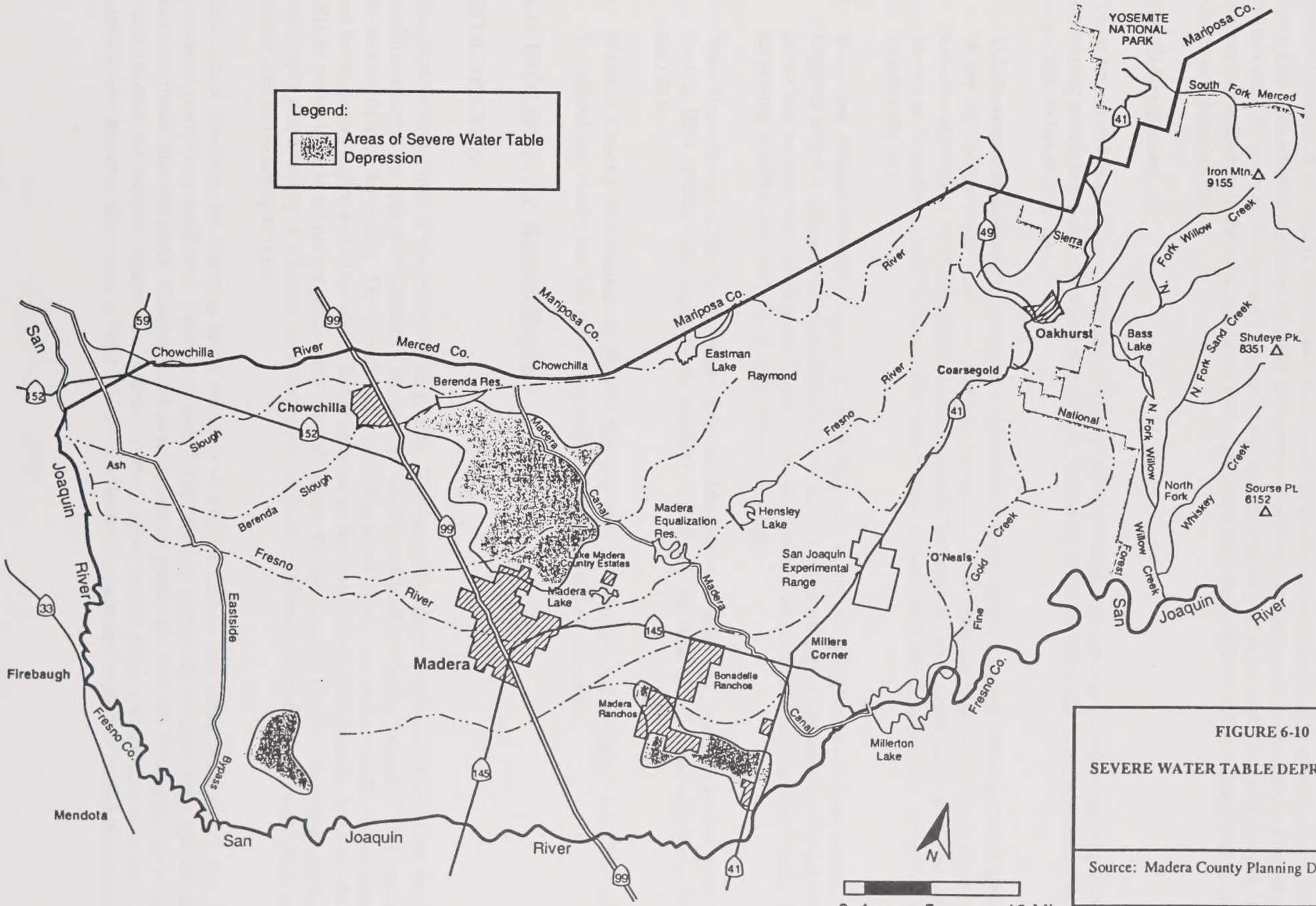


FIGURE 6-10

SEVERE WATER TABLE DEPRESSION AREAS

Source: Madera County Planning Department, 1992

Maps Prepared 8/93 by: H. T. Harvey & Associates

Most cases of water degradation in the county have been isolated incidents. Some water samples in the western portion of the county have shown high levels of alkali, which is detrimental to agriculture. There have also been isolated instances of wells contaminated with agricultural pesticides; these were promptly abandoned. In general, the county's ground water quality situation is ideal; high clay content and other impervious sediments in the soils, combined with a low water table make it difficult for contaminants to reach the groundwater supply.

Regulatory Setting

There are several federal, state, regional, and local agencies which regulate water quality, for the purposes of ensuring public health and environmental quality. Following is a list of the major water quality regulators, as pertains to Madera County.

- **U.S. Environmental Protection Agency:** sets National water quality standards under the Safe Drinking Water Act and the Clean Water Act; regulates hazardous wastes that may negatively affect ground and surface waters under the Comprehensive Environmental Response, Compensation and Liability Act (also known as Superfund); and the Toxic Substances Control Act; and Federal Insecticide, Fungicide and Rodenticide Act.

- **State and Regional Water Quality Control Boards:** under the direction of the State Board, the Regional Board is charged with formulating a basin plan for the protection of ground water by indirectly protecting surface water, setting standards and issuing permits for waste dischargers, and periodically inspecting facilities and performing water quality sampling.

- **State Department of Health Services:** enforces drinking water standards, which arepromulgated by the U.S. EPA. Public water suppliers are required to routinely test water supplies and submit results to the DHS.

- **Madera County Environmental Health Department:** inventories and monitors over 200 wells throughout the county, and has permitting authority for new well development.

6.6 BIOLOGICAL RESOURCES

INTRODUCTION

The physical topography of the county varies greatly. The rugged mountainous terrain of the Sierra and its foothills occupies the eastern two-thirds of the county. The flat lowlands of the San Joaquin Valley occupy the western third of the county. The climate varies according to elevation. The arid lowlands, cool in winter and hot in summer, give way to the cooler wetter climates of the Sierra where precipitation, much of which falls as snow, is 30 to 40 inches greater than that of the nearby San Joaquin Valley. The varied physical topography and diversity of climates have favored an impressive diversity of biotic habitats, and plant and animal species occurring in them.

This section describes the common biotic elements of Madera County and notes those which may be considered particularly significant. These "common" biotic elements include the principal biotic habitats and their constituent flora and fauna. Croplands, urban areas, annual grasslands, blue oak woodlands and mixed conifer forests are habitats common to Madera County. Many native plants and animals of economic, scientific, and aesthetic value occur in these habitats. Furthermore, plants and animals of limited distribution,

including those which have been placed on state and federal lists as threatened or endangered, are often associated with them.

Special attention has been given to habitats of limited distribution in the county. Vernal pools, riparian habitats of various types and fresh emergent wetland are habitats which were once widespread in the Central Valley. Much of the area formerly occupied by these habitats has since been converted to other uses. These habitats have been important to narrowly distributed endemic (native) plants and resident and migratory wildlife and have been given high priority for protection by the California Department of Fish and Game.

Some plant and animal species have been afforded special status according to provisions of state and federal endangered species legislation. The Bald Eagle, San Joaquin kit fox, blunt-nosed leopard lizard, and Ferris' bird's-beak are state- and federally- listed as endangered. All occur in Madera County. The federally endangered Fresno kangaroo rat probably occurs in portions of Madera County. The California tiger salamander, western pond turtle, giant garter snake, and three species of freshwater shrimp have been petitioned for listing as federally-endangered and may be listed in 1994 or 1995. Hartweg's pseudobahia, a small member of the sunflower family, has been proposed for listing as federally-endangered. Three grasses endemic to vernal pools are candidates for listing. All occur in Madera County. Special status plants and animals, and the habitats which sustain them, are afforded special protection under state and federal law; this protection which could significantly affect County planning decisions.

BIOTIC HABITATS

This section describes 26 biotic habitats located in Madera County. The names of these habitats have been derived from *A Guide to Wildlife Habitats of California* (Mayer et al. 1988). Figure 6-11 shows their general location in the county, although not all 26 habitats are shown in the figure. Some are much too small to show at the scale of the map provided. Furthermore, much of the county, particularly within the Sierra Nevada, supports a mosaic of habitats, the spatial arrangement of which is governed by slope aspect, fire history, soil types and micro-climate. These habitats could not be mapped in any detail.

Madera County can be divided into three sections. Roughly one-third of the County lies within the San Joaquin Valley. In Madera County, this valley extends from the San Joaquin River in the west to the Sierra foothills in the east. The central third of the county lies within the foothills of the Sierra Nevada. Daulton, the Madera Equalization Reservoir, and the intersection of Highways 41 and 145 are all located at the toe of the western foothills. Ahwahnee, Oakhurst and North Fork are all located just west of the transition from foothill to the more montane terrain of the Sierra Nevada. The eastern third of the county is rugged mountainous terrain extending to the crest of the Sierra.

San Joaquin Valley Habitats

Madera County encompasses a small portion of the eastern San Joaquin Valley. Elevations range from approximately 200 to 400 feet national geodetic vertical datum (NGVD). Summers are hot and dry. Winters are cool. Ten to fifteen inches of rain fall between the months of October and May. Historically, snowmelt from the Sierra and local runoff exited the county via three major rivers, the Chowchilla, the Fresno, and the San Joaquin. Flows in these rivers are now much reduced or absent. Dams located in the foothills of the Sierra store runoff which is then diverted to croplands, orchards and vineyards during the summer drought. Most surface runoff is now confined to small drainages such as Berenda, Dry, Daulton, Mudsprings, Cottonwood and Little Dry Creeks, each of which experience brief periods of seasonal flow.

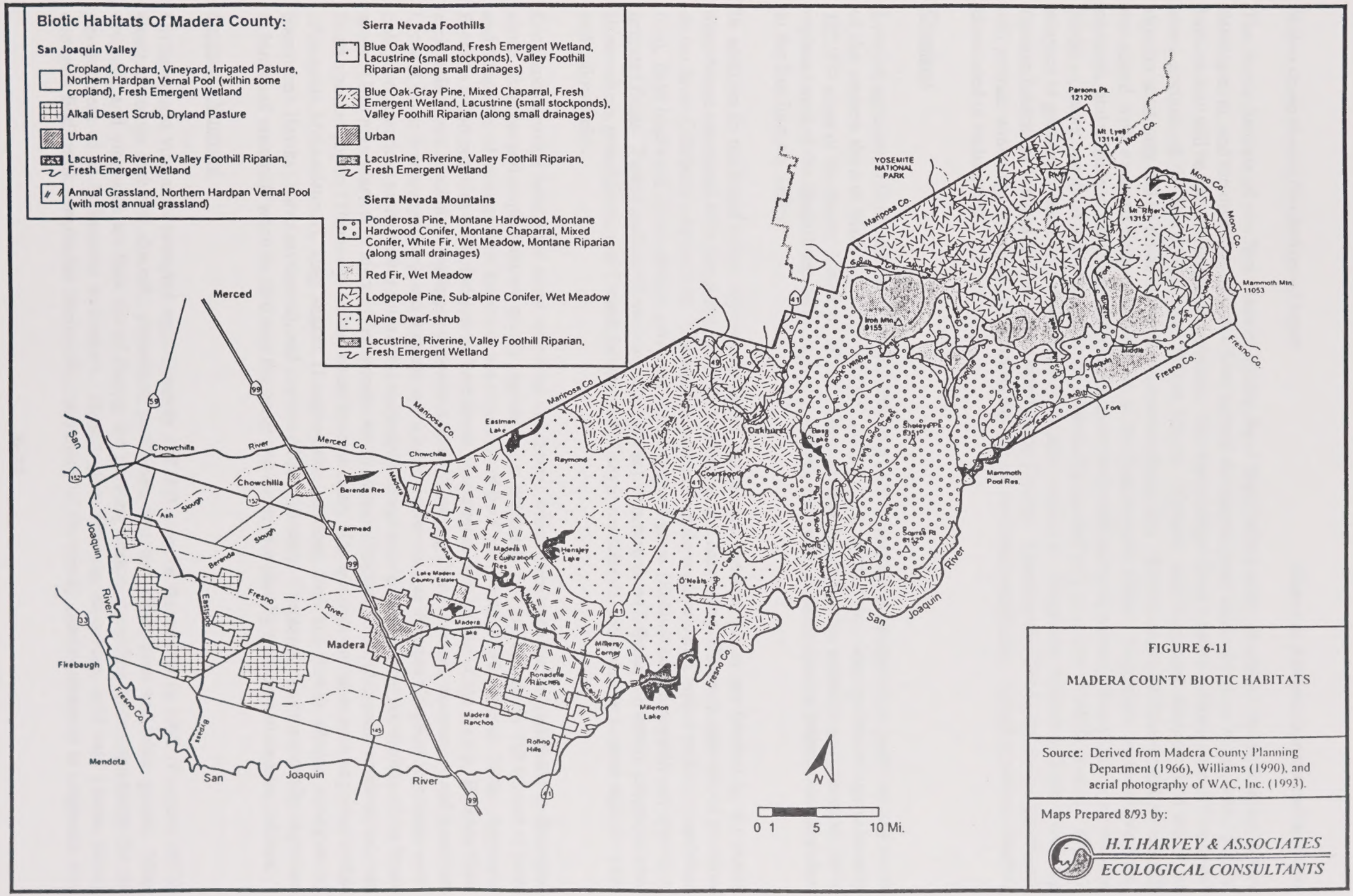


FIGURE 6-11

MADERA COUNTY BIOTIC HABITATS

Source: Derived from Madera County Planning Department (1966), Williams (1990), and aerial photography of WAC, Inc. (1993).

Maps Prepared 8/93 by:

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The biotic habitats of the San Joaquin Valley have been substantially modified by agriculture, urban development, and the diversion of water from natural drainages, particularly the three large rivers. Native habitats may still be found in scattered locations. Remnant riparian forests and woodlands may still be found along portions of the San Joaquin and Fresno Rivers. Narrow, and frequently discontinuous stands of riparian scrub may still be found along some seasonal drainages. Native scrub and alkali grassland are still associated with some alkaline soils just east of the San Joaquin River. Croplands, orchard-vineyards, pastures, and urban and suburban centers have, however, replaced most native habitats. Even so, western Madera County continues to provide important habitat for resident and migratory wildlife species. Wildlife adapted to grasslands must now make do with suitable croplands. Migratory wildlife still use remaining riparian habitats as avenues for movement through the County. Riparian woodlands and annual grasslands still provide wintering, breeding, and foraging habitat for terrestrial vertebrates, including several listed as threatened or endangered.

Cropland

Leveled agricultural fields and ancillary facilities (e.g., roads, residences, corporation yards) occupy much of the western third of Madera County. In 1992 cotton, corn, alfalfa, etc., were grown on approximately 125,000 acres of the county (Porteous 1992). These croplands, along with orchards and vineyards, have replaced most of the alkali desert scrub, annual grassland, and valley foothill riparian habitat once abundant in the San Joaquin Valley.

In addition to cultivated crops, weedy non-native annual and biennial plants are favored by the yearly disturbance associated with ploughing, discing, harrowing, and harvesting. Common agricultural practices do not favor California's native flora. Common purslane (*Portulaca oleracea*), London rocket (*Sysimbrium irio*), field bindweed (*Convolvulus arvensis*), and barnyard grass (*Echinochloa crusgalli*) are typical of irrigated fields. Turkey mullein (*Eremocarpus setigerus*), puncture vine (*Tribulus terrestris*), telegraph weed (*Heterotheca grandiflora*), and Canada horseweed (*Conyza canadensis*) are common to road right-of-ways and fallow fields.

Croplands provide habitat for some terrestrial vertebrates which once used native grasslands or chenopod scrub. Reptiles and amphibians are poorly represented in croplands, but approximately 110 species of birds and 40 species of mammals are known to use croplands of the Central Valley (Mayer et al. 1988). Appendix B of this report provides a list of terrestrial vertebrates occurring in each habitat of the county. Resident birds such as Brewer's Blackbird (*Euphagus cyanocephalus*), Mourning Dove (*Zeniada macroura*), and American Crow (*Corvus brachyrhynchos*), and summer and winter visitors such as Western Kingbird (*Tyrannus verticalis*) and American pipit (*Anthus spinoletta*) commonly forage in croplands. Large populations of the house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californicus*), and Botta's pocket gopher (*Thomomys bottae*) occur in some fields. These attract predators such as gopher snakes (*Pituophis Melanoleucus*), king snakes (*Lampropeltis getulus*), Red tail Hawks (*Buteo jamaicensis*), Swainson's Hawks (*Buteo swainsoni*), and coyotes (*Canis latrans*). Croplands can be especially important to birds and mammals when located near the water and cover provided by riparian and riverine habitats.

Orchard - Vineyard

Orchards and vineyards occupied approximately 157,000 acres of the county in 1992 (Porteous 1992). Common crops included almonds, pistachios, nectarines, figs, and table, wine and raisin grapes. Most orchards and vineyards are kept disced during the growing season, providing little opportunity for the development of an herbaceous understory. Ripgut grass (*Bromus diandrus*), wild oats (*Avena fatua*), common fiddleneck (*Amsinckia intermedia*), and many of the weedy species common to croplands may

temporarily become established in spring. As for croplands, vineyards provide little habitat for California's native flora.

Orchards provide limited habitat for terrestrial vertebrates. The absence of an herbaceous understory deprives many species of both food and cover. On-going maintenance operations may discourage breeding. Even so, 12 species of reptiles and amphibians, more than 90 species of birds, and 35 species of mammals may breed or forage in vineyards and orchards. For example, gopher snakes and western fence lizards (*Sceloporus occidentalis*) are common in these habitats. Furthermore, large numbers of American Crows, Yellow-billed Magpies (*Pica nuttalli*), White-crowned sparrows (*Zonotrichia leucophrys*) and American Robins (*Turdus migratorius*) forage in orchards and vineyards, as do mammals, such as the black-tailed hare (*Lepus californicus*) and deer mouse.

Pasture

More than 400,000 acres of the County's agricultural lands were used for pasture in 1992 (Porteous 1992). Some pastures are flood irrigated and support a mix of perennial grasses and forbs suitable for livestock. Pasture lands may support Kentucky fescue (*Festuca arundinacea*), dallisgrass (*Paspalum dilatatum*) perennial ryegrass (*Lolium perenne*), bermuda grass (*Cynodon dactylon*), and white clover (*Trifolium repens*). Undesirable weedy species such as bull thistle (*Cirsium vulgare*), spiny clotbur (*Xanthium spinosum*), cocklebur (*Xanthium strumarium*), and pacific rush (*Juncus effusus* var. *pacificus*) frequently become established in irrigated pastures. Non-irrigated pasture is best classified as annual grassland (see discussion under annual grassland).

Pastures provide many of the same values for terrestrial vertebrates as annual grassland (see discussion below). Many terrestrial vertebrates are found in both habitats. Flooded pastures are particularly important as foraging habitat for the Brewer's Blackbird, Red-winged and Tricolored Blackbirds (*Agelaius phoeniceus* and *A. tricolor* respectively), Great Blue Heron (*Ardea herodias*), Great Egret (*Casmerodias albus*) and, near the San Joaquin River, White-faced Ibis (*Plegadis chihi*). Small mammals such as the deer mouse, California vole, and Botta's pocket gopher attract many of the same predators to this habitat as some croplands and annual grassland.

Annual Grassland

Annual grasslands occur along the eastern edge of the San Joaquin Valley between the Madera Canal and a line formed by Eastman, Hensley and Millerton Lakes. This grassland continues into the Sierra foothills, forming the understory of blue oak and blue oak-digger pine woodland. A scattering of grassland habitats still remains immediately west of the Madera Canal, but most of this habitat has been converted to croplands, vineyards, orchards, and residential subdivisions.

Non-native annual grasses favored by livestock grazing provide most of the vegetative cover in annual grasslands. Ripgut, soft chess (*Bromus mollis*), wild oats, and rat-tail fescue (*Vulpia myuros*) are the most common grasses. Red-stemmed and broad-leaf filaree (*Erodium cicutarium* and *E. botrys* respectively) are typical non-native forbs. Native forbs common to this community during the spring include rusty popcorn flower (*Plagiobothrys nothofulvus*), Eastwood's fiddleneck (*Amsinckia intermedia* var. *eastwoodeae*), Chile trefoil (*Lotus subpinnatus*), and several species of clover (*Trifolium tridentatum*, *T. ciliolatum*, *T. amplectens*, and *T. depauperatum*). During August and September dense stands of Heerman's tarweed (*Holocarpha heermanii*) can be found interspersed with turkey mullein and vinegar weed (*Trichostema lanceolatum*).

Many terrestrial vertebrates depend on annual grasslands for breeding, foraging, and wintering habitat. As many as 25 species of reptiles and amphibians, more than 100 species of birds and 50 species of mammals are known to use grassland habitats such as those found in Madera County. The California tiger salamander (*Ambystoma californiense*), western spadefoot (a toad) (*Scaphiopus hammondi*), western pond turtle (*Clemmys marmorata*) California Horned Lark (*Eremophila alpestris*), Long-billed Curlew (*Numenius americanus*), and Golden Eagle (*Aquila chrysaetos*) are examples of grassland species sufficiently limited in distribution throughout the state to have been designated state threatened or endangered, candidates for such designation, or species of special concern.

Annual grasslands provide critical habitat for a variety of amphibian and reptile species. The California tiger salamander and western spadefoot breed in vernal pools, but estivate most of the year in the grassland burrows of various small mammals. The western pond turtle spends most of its life in the aquatic habitat of rivers and creeks, but constructs a nest for its eggs in grassland habitats up to 0.5 miles away. The Gilbert's skink (*Eumeces gilberti*) and western fence lizard occur in annual grasslands, especially along fence lines and grassland edges where they are close to cover. Gopher snakes commonly hunt lizards and small mammals in grasslands.

Resident grassland birds of Madera County include the Burrowing Owl (*Speotyto cunicularia*), Western Meadowlark (*Sturnella neglecta*), Mourning Dove and Horned Larks. In the winter these species are joined by Long-billed Curlews, American Pipits and Savannah Sparrows (*Passerculus sandwichensis*) among others. Raptors, which nest and roost in adjacent riparian habitats, hunt here. These include Black-shouldered Kites (*Elanus caeruleus*), Red-tailed Hawks, Golden Eagles, American Kestrels (*Falco sparverius*), Common Barn Owls (*Tyto alba*), and Great Horned Owls (*Bubo virginianus*).

Large populations of small mammals provide a primary source of prey for many predators. The most obvious small mammal, the California ground squirrel (*Spermophilus beecheyi*), occurs in numerous scattered colonies. Grasslands also provide an abundant food supply for small mammals such as California vole, deer mouse, Botta's pocket gopher, and western harvest mouse (*Reithrodontomys megalotis*). In turn, these small mammals serve as prey for coyotes, red foxes (*Vulpes vulpes*), badgers (*Taxidea taxus*), and avian predators.

Northern Hardpan Vernal Pool

Northern hardpan vernal pools are confined to soils with a defined iron-silica hardpan or claypan layer one to two feet below the soil surface (see Figures 6-7 and 6-9 for the general locations of vernal pools in Madera County). In Madera County these soils include the Cometa-Whitney association and the San Joaquin and Redding series. A hummocky topography has developed in these soils with numerous small depressions alternating with low mounds. The depressions fill with runoff during the winter, thus forming seasonal pools perched on an impervious hardpan. The pools gradually shrink and dry from evaporation at the end of the rainy season. The deepest depressions may retain some ponded water through May and into June.

Vernal pools provide habitat for a flora uniquely adapted to them. Although some aquatic plants, such as hairy water fern (*Marsilea vestita*) occur in them, most vascular plants are emergent or reach maturity at the very margins of gradually receding pools. The phenology (blooming period) of some vernal pool plants is such that bands or concentric rings of different blooming species may be visible around the pools in April and May. Examples of plants common to pools of Madera County are Vasey's button celery (*Eryngium vaseyi*), slender popcorn flower (*Plagiobothrys stipitatus*), double-horn downingia (*Downingia bicornuta*), involucrate evax (*Evax caulescens*), and dwarf woolly-heads (*Psilocarphus brevissimus*). Some pools along Highways 41 and 145, as well as other scattered locations in the County, support small populations of special status plants, such as San Joaquin orcutt grass (*Orcuttia inaequalis*), hairy orcutt grass (*Orcuttia*

Large areas of alkali desert scrub, which have been heavily grazed, now support a variety of non-native annual grasses such as ripgut, soft chess, and rat-tail fescue, with only a few chenopod scrub species present.

Many of the wildlife species associated with alkali desert scrub have suffered substantial population declines as this habitat has been converted to croplands, orchards and vineyards. Rodent and predator control programs may have had adverse effects on small mammal populations (Williams 1991). Several terrestrial vertebrates using alkali scrub and alkali grassland habitats are now afforded some measure of protection by endangered species laws. As many as 10 species of reptiles and amphibians, 44 species of birds and 34 species of mammals are known to occur in these habitats (Mayer et al. 1988). Among these are western spadefoot, blunt-nosed leopard lizard (*Gambelia silus*), San Joaquin whipsnake (*Masticophis flagellum ruddocki*), Burrowing Owl, San Joaquin kit fox (*Vulpes macrotis mutica*), and Fresno kangaroo rat (*Dipodomys nitratoides exilis*).

Urban

Urban habitats of Madera County are, for the purposes of this analysis, towns and subdivisions where native habitats have been substantially modified by homes and businesses. Such areas include towns such as Chowchilla and Madera. They also include subdivisions of relatively small lots such as Bonadelle Ranchos, Madera Ranchos, and Valley Lake Ranchos. Undeveloped lots in these subdivisions still support other habitats such as annual grassland and vernal pools.

Streets, homes, commercial buildings, and residential and commercial landscaping have favored an assemblage of plants and animals quite different than that found in nearby croplands, orchards and vineyards, and annual grassland. Native botanical resources have been replaced by ornamental trees and shrubs (e.g., pines, eucalyptus, Modesto ash, pyracantha, oleander). Although reptiles and amphibians are poorly represented in urban habitats, up to 120 species of birds may use urban habitats, many only briefly during the spring and fall migration (Mayer et al 1988). Several types of birds such as White-crowned Sparrows, Dark-eyed Juncos (*Junco hymealis*) and Scrub Jays are resident in urban habitats. However, their overall value to wildlife is relatively low due to the periodic disturbances associated with maintaining lawns and the presence of humans, cars, and domestic pets. Introduced species like the Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*), house mouse (*Mus musculus*), and Norway rat (*Rattus norvegicus*) often displace native species that are more sensitive to human disturbance.

Lacustrine

Lakes, in the form of reservoirs, are a minor habitat in the San Joaquin Valley portion of Madera County. Berenda Reservoir, Madera Lake, and various small farm or stock ponds provide year-round to seasonal open water habitat. Lacustrine habitats function in a similar manner to riverine habitats in providing habitat for wildlife (see below).

Riverine

The aquatic habitat associated with rivers is now confined to the San Joaquin River between Friant Dam and the Madera and Merced County line. Downstream of Firebaugh, flows in the river are greatly reduced. The river is fringed by a narrow band of riparian habitat and discontinuous stands of emergent vegetation. Although riverine habitat was observed in the Fresno River below Hensley Dam in 1993, it is seasonal in occurrence, and was not present at all through much of the drought (1987 through 1992).

The San Joaquin River is home to many fish including native species such as Sacramento squawfish (*Ptychocheilus grandis*), hardhead (*Mylopharoden conocephalus*), rainbow trout (*Onchorynchus mykiss*) and Sacramento perch (*Archoplites interruptus*). Introduced fish that have become common include largemouth and smallmouth bass (*Micropterus salmoides* and (*Micropterus dolomieui*), green sunfish (*Lepomis cyanellus*), mosquito fish (*Gambusia affinis*), and carp (*Cyprinus carpio*).

Riverine habitat is important to reptiles and amphibians occurring in adjacent riparian habitats. Western toads, pacific treefrogs, and California newts require aquatic habitats of rivers and creeks for reproduction. Seasonal pools in meander channels and oxbows are well suited for egg laying. Bullfrogs utilize aquatic habitats for foraging and cover as well as reproduction. Western pond turtles spend the bulk of their long lives in aquatic habitats, but wander up to 0.5 miles away to build a nest.

The San Joaquin River provides habitat for several birds. Waterfowl such as the Wood Duck (*Aix sponsa*), Common Goldeneye (*Bucephela clangula*), Bufflehead (*Bucephela alboela*), and Common Merganser (*Mergus merganser*) use the river between Friant and Highway 99. Other birds that forage in the river include Double-crested Cormorant (*Phalacorcorax auritus*), Pied-billed Grebe (*Podilymbus podiceps*), and Belted Kingfisher (*Ceryle alcyon*). Bald Eagles that winter at Millerton Lake are known to forage along the San Joaquin River below Friant Dam.

Mammals from surrounding areas utilize riverine habitat as a source of drinking water. In addition, beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*) use the river for cover and as a movement corridor. These two species are never found far from water.

Fresh Emergent Wetland

Fresh emergent wetland is another name for freshwater marsh. This habitat is associated with shallow water of the San Joaquin River, the Eastside Bypass, Ash and Berenda Sloughs, and other low-lying wet habitats of Madera County. It is characterized by emergent hydrophytic (water-loving) vegetation rooted in water less than 2 feet in depth. Plants typical of this habitat include cattails (*Typha* sp.), California bulrush (*Scirpus californicus*), three square (*Scirpus americanus*), umbrella sedge (*Cyperus eragrostis*), arrowhead (*Saggitaria* sp.), creeping spikerush, and Baltic rush.

Fresh emergent wetland is of considerable value to wildlife. It provides cover and breeding habitat, as well as a rich foraging area for as many as 10 species of reptiles and amphibians, more than 100 species of birds, and 25 species of mammals. Terrestrial vertebrates typically found in this habitat include bullfrogs (*Rana catesbeiana*), common garter snakes (*Thamnophis sirtalis*), Snowy Egrets (*Egretta thula*), American Coots (*Fulica americana*), Marsh Wrens (*Cistothorus palustris*), Red-winged Blackbirds, and muskrats.

Sierra Nevada Foothill Habitats

The foothills of the Sierra Nevada comprise gentle rolling to rugged terrain between the elevations of 400 to 3,000 feet National Geodetic Vertical Datum (NGVD). Native foothill habitats have been modified by grazing and low density residential development, but, with the possible exception of riparian habitats, their structure and floristic elements remain much the same as a half century ago. Foothill habitats are used by resident native wildlife for breeding and foraging. They provide important wintering habitat for deer and various predators which summer at higher elevations. Riparian corridors, although degraded by grazing, fragmented by development, or dewatered for residential and golf course irrigation, continue to serve as important movement corridors for migratory species. Foothill habitats are, therefore, important connecting links between the San Joaquin Valley and the Sierra.

Blue Oak Woodland

The low foothills of the Sierra Nevada support an open woodland of blue oaks (*Quercus douglasii*). This woodland is found between the elevations of 400 and 1,500 feet. Mean rainfall varies from about 15 inches at the lower elevations to nearly 20 inches at the higher elevations. Eastman, Hensley, and Millerton Lakes, as well as the towns of Raymond, Knowles, and O'Neals are located within this habitat. Although the blue oak is the dominant tree of this habitat, interior live oaks (*Quercus wislizenii*) and California buckeyes (*Aesculus californicus*) are occasionally found here. Because of the scattered pattern of the trees, canopy closure is uncommon. Shrubs, such as poison oak (*Toxicodendron diversilobum*) and Mariposa manzanita (*Arctostaphylos mariposa*) are uncommon. Instead, the understory consists of non-native annual grasses and associated forbs typical of annual grassland.

Wildlife use of blue oak woodland habitats is, in many ways, similar to that of annual grassland. Oak trees, however, provide cover, breeding and foraging habitat for a number of additional species. Thirty-five species of reptiles and amphibians, 130 species of birds and more than 50 species of mammals are known to use blue oak woodlands in Madera County. Arboreal salamander (*Aneides lugubris*), Lark Sparrow (*Chondestes grammacus*), Plain Titmouse (*Parus inornatus*), and California Quail (*Callipepla californica*) are common resident species. Blue oak woodland provides important wintering habitat for Lewis's Woodpecker (*Melenerpes lewis*) and summer breeding habitat for Ash-throated Flycatchers. Resident mule deer, bobcats (*Lynx rufus*), and mountain lions occur throughout this habitat.

Blue Oak-Digger Pine

An association of blue oaks and digger pines (*Pinus sabiniana*) occurs upslope of the blue oak woodland at elevations ranging from 1,500 to nearly 3,000 feet NGVD. Mean rainfall varies from approximately 20 inches at the lower elevations to more than 30 inches in Oakhurst and North Fork, both at 2,700 feet in elevation.

At the lower elevations this association includes patchy to occasionally dense stands of blue oaks, digger pines, interior live oaks, and California buckey. Above 2,000 feet, blue oaks may be replaced by valley oaks (*Quercus lobata*). In the Oakhurst Basin, valley oaks of three to four feet in diameter are not uncommon.

In contrast to the blue oak woodland, the blue oak-digger pine association includes a shrub understory consisting of Mariposa manzanita, poison oak, chaparral whitethorn (*Ceanothus leucodermis*), redberry (*Rhamnus crocea* ssp. *illicifolia*), coffeeberry (*Rhamnus californicus* ssp. *ilicifolia*), silver lupine (*Lupinus albifrons*), and skunkbush (*Rhus trilobata*). Although in favored locations this shrub understory can be quite dense, it is generally patchy in distribution, being replaced by annual grasses and associated forbs in open sunny locations. Spring-flowering forbs are numerous and showy. Many are the same species found in annual grasslands at lower elevations, but others, such as baby blue-eyes (*Nemophila menziesii*), whorled lupine (*Lupinus densiflorus*), bird's-eye gilia (*Gilia tricolor*), and several species of *Clarkia*, including those referred to as fare-well to spring, reach their peak in this habitat.

The structural diversity of this habitat adds to the diversity of wildlife found there. Thirty species of reptiles and amphibians, 145 species of birds, and 55 species of mammals are known to occur in this habitat. Western rattlesnakes and common kingsnakes as well as gray foxes (*Urocyon cinereoargenteus*) and bobcats feed on a variety of small rodents that includes deer mice, brush mice (*Peromyscus boylii*), western harvest mice, dusky-footed woodrats (*Neotoma fucipes*) and Merriam's chipmunks (*Tamias merriami*). The large

acorn crop available here provides food for many animals including Titmice, California Quail, Acorn Woodpecker, Scrub Jays, and mule deer. Other birds found here are Western Bluebird (*Sialia mexicana*), White-breasted Nuthatch (*Sitta carolinensis*), and Hutton's Vireo (*Vireo huttoni*).

Mixed Chaparral

Mixed chaparral is an association of various shrub species adapted to hot dry slopes at 2,000 to 3,000 feet in elevation. Typical of these shrubs are thick leathery evergreen leaves. This is a fire adapted community. Mature stands of mixed chaparral, with considerable dead wood and flammable vegetation, are very susceptible to explosively-hot, fast-moving fires. Many chaparral species have the ability to resprout from burned stumps. Extensive stands of this habitat are intermixed with blue oak-digger pine habitat in the Oakhurst Basin and south of Bass Lake, Thornberry Mountain, and Ward Mountain (near Fine Gold) on south-facing slopes. Although occasional digger and ponderosa (*Pinus ponderosa*) pines may intrude in this habitat, it generally consists of dense even-age stands of chaparral whitethorn, poison oak, Mariposa manzanita, interior live oaks, California buckeyes, flannel bush (*Fremontia californica*), and chamise (*Adenostoma fasciculatum*). While generally quite dense, small openings in this chaparral are occupied by non-native annual grasses and associated forbs.

Mixed chaparral of Madera County provides habitat for more than 30 reptiles and amphibians, 100 species of birds, and 55 species of mammals. These may include California whipsnake (*Masticophis lateralis*), California Quail (*Callipepla californica*), Wrentit (*Chamaea fasciata*), California Thrasher (*Toxostoma redivivium*), and Rufous-sided Towhee (*Pipilo erythropthalmus*), and California mouse (*Peromyscus californicus*). Mixed chaparral is important winter foraging habitat for mule deer, especially following fires, when lush new growth of chaparral shrubs provides abundant browse.

Valley Foothill Riparian

Narrow but often lush corridors of riparian trees are associated with foothill rivers and creeks. Riparian associations are found along the channels of the San Joaquin, Chowchilla, and Fresno Rivers, Coarse Gold Creek, Fine Gold Creek, Miami Creek, Willow Creek, and their tributaries. The width and overall quality of these riparian corridors varies considerably. Many creek channels, such as Coarse Gold Creek upstream from the town of Coarsegold, are narrow and deeply incised such that only a narrow band of riparian trees could become established on the channel banks. At greater distances from the Creek, oaks and pines are located on steep slopes too far from the water that riparian trees require. Yet Fine Gold Creek, in places, provides a broad floodplain 200 to300 feet across, on which a dense riparian forest has become established. Intensive grazing has denuded some riparian habitats, including those along Fine Gold Creek, of much of their shrub understory. Some riparian trees along Miami Creek appear to be dying, possibly as a result of the Creek being dewatered during the summer from diversions for golf course irrigation.

Foothill riparian associations fall into two general categories, Great Valley willow scrub and white alder riparian forest (Holland 1986). At lower elevations, the bed and banks of the Chowchilla River, Fresno River, Coarse Gold Creek, and their small tributaries provide habitat for scattered to dense stands of red and sandbar willows. Other species observed include Fremont's cottonwoods and mule fat (*Baccharis viminea*). At higher elevations, creek banks and narrow floodplains are often thickly lined with white alders and an occasional Oregon ash. Both red and sandbar willows and Fremont's cottonwoods are common at these higher elevations. Large valley oaks are often associated with riparian habitats in the Oakhurst Basin. Understory species include mule fat, California blackberry (*Rubus ursinus*), buttonbush, and stinging nettle (*Urtica dioica* ssp. *holosericea*). California grape (*Vitis californicus*) may festoon the branches of overstory trees.

As on the valley floor, foothill riparian habitat is used by a rich diversity of wildlife species. Most of the same species occurring in riparian habitats of the San Joaquin Valley occur in foothill riparian habitats. Others include western aquatic garter snake (*Thamnophis couchii*), Yellow Warbler (*Dendroica petechia*), Black-headed Grosbeak (*Pheucticus melanocephalus*), raccoon (*Procyon lotor*) and ringtail (*Bassariscus astutus*) may be expected along foothill rivers and creeks. Riparian habitats are particularly important as movement and migration corridors for mule deer, predatory mammals, and other wildlife.

Lacustrine

Eastman, Hensley, and Millerton Lakes are large reservoirs located in the lower foothills on the Chowchilla, Fresno, and San Joaquin Rivers respectively. Other impoundments include Kerckhoff and Redinger Lakes, small recreational lakes created in Yosemite Lakes Park and Indian Lakes Estates, and innumerable small stock ponds throughout the foothills.

Though these reservoirs are all man-made, they support several important wildlife resources. Game fish such as rainbow trout, channel catfish (*Ictalurus lacustris*), striped bass (*Marone saxitalis*), and spotted bass (*Micropterus punctulatus*) make the larger reservoirs popular fishing areas. Millerton Lake has been well documented as an important wintering area for Bald Eagles (Suydam and Conrad 1985, Rhodehamel 1991). In the spring of 1993, a pair of Bald Eagles bred at Eastman Lake. In winter, Millerton Lake is the roosting area for a large number of gulls (*Larus spp.*) that forage all over central Fresno and Madera Counties.

Riverine

Three rivers descend from the Sierra Nevada through the foothills of Madera County. The Chowchilla and Fresno Rivers provide seasonal riverine habitat upstream of Eastman and Hensley Lakes. These rivers are reduced to negligible flows during the late summer, especially during drought years. The San Joaquin River upstream of Millerton, Kerckhoff, and Redinger Lakes drains a much larger watershed than the previous two rivers. This watershed, which encompasses the highest peaks of the Sierra Nevada, collects considerable snow during the winter. The San Joaquin Riverthe therefore sustains significant flows throughout the summer. All three rivers support sandbar willows and mulefat in portions of their beds. Emergent vegetation, such as cattails and creeping spikerush, occur in shallow calm water. Clumps of rough sedge (*Carex senta*) grow on the river's margins.

The wildlife use of foothill riverine habitats is similar to riverine habitats on the valley floor, though many of the introduced warm-water fish species may be absent. Common Merganser and American Dipper (*Cinclus mexicanus*) breed along stretches of these rivers. Virtually all of the rivers and streams of draining these foothills provide habitat for western pond turtles. Although largely extirpated from these watercourses, foothill yellow-legged frog (*Rana boylei*) and California red-legged frog (*Rana aurora*) may still be found in some streams.

Fresh Emergent Wetland

Fresh emergent wetlands of the foothills are much like those of the San Joaquin Valley. Emergent vegetation in the form of cattails and creeping spikerush may be found on the margins of many small farm ponds and small recreational lakes.

Wildlife species using these wetlands are similar to those using the emergent wetlands of the San Joaquin Valley. Because the size of the patches of habitat is much smaller, wildlife populations are expected to be smaller and the diversity of species occurring in them would be less than in the valley.

Urban

Urban habitats are confined to Oakhurst, North Fork, and Coarsegold. Very small areas of urban development may be found in Raymond, O'Neals, and various small subdivisions such as Goldside. For the purpose of this analysis, Yosemite Lakes Park, Indian Lakes Estates, and other subdivisions have been considered part of the blue oak-digger pine woodland. The large lot sizes of these subdivisions have ensured that most of the native vegetation has been preserved. As with urban areas in the San Joaquin Valley, the urban areas of the foothills have been planted with ornamental non-native plants, or have become habitat for a variety of annual weedy grasses and forbs.

Urban environments in the foothills have the same effects on wildlife as those urban environments of the San Joaquin Valley.

Sierra Nevada Mountain Habitat

The Sierra Nevada is a patchwork of biotic habitats which, for the purposes of this study, could not be mapped in great detail in Figure 6-7. For example, the area depicted as mixed conifer is really a mosaic of habitats including ponderosa pine, montane hardwood, montane hardwood-conifer, white fir, Sierran mixed conifer, montane chaparral, lacustrine, and riverine. The spatial relationships of these habitats has much to do with elevation, aspect (e.g., north-facing, south-facing slopes), logging, and fire history. The location of good examples of these habitats in Madera County has been mapped in Figure 6-11 where possible. Habitats of the Sierra are the least altered by agricultural and residential development of all the biotic habitats of Madera County. Yet, the fragmentation of movement corridors in the San Joaquin Valley and Sierra foothills, the loss of foothill wintering habitat from residential development, the damming of rivers and streams, and, potentially, the high levels of air pollution, all have adverse effects on the fish and wildlife resources of the Sierra Nevada.

Ponderosa Pine

Ponderosa pine forest occurs in Madera County from 3,000 feet to 5,000 feet in elevation, or somewhat higher on favored south-facing slopes. Good examples of this habitat can be seen in the vicinity of Bass Lake, north-facing slopes of Thornberry Mountain, and the upper watershed of Little Fine Gold Creek near Teaford Meadows. In areas of frequent low-intensity forest fires, this habitat is characterized by open stands of mature ponderosa pines. In Madera County, this habitat is more frequently made up of relatively dense stands of second growth trees. While ponderosa pines are dominant in this habitat, incense cedars (*Calocedrus decurrens*), black oaks (*Quercus kelloggii*), and canyon live oak (*Quercus chrsolepis*), sugar pine (*Pinus lambertiniana*), and Pacific dogwood (*Cornus nuttalii*) may also be present. Although the shrub understory may be poorly developed in frequently burned stands, the aromatic mountain misery (*Chamaebatia foliolosa*) is nearly ubiquitous in this habitat. A sparse to very dense mixed understory of Mariposa manzanita, California coffeeberry, Sierra gooseberry (*Ribes roezlii*), and deer brush (*Ceanothus integerrimus*) may be found in ponderosa pine forest.

Ponderosa pine and the following two forest habitats have similar wildlife assemblages. Although the proportion of the dominant trees change, the species composition is similar. Nearly 30 species of reptiles and amphibians, 130 species of birds, and 65 species of mammals use these habitats. Pacific slender salamander (*Batrachoceps pacificus*) and ensatina (*Ensatina eschscholtzi*) can be found under fallen logs and other forest debris. Acorns are an important food source for many animals including Acorn Woodpeckers, Band-tailed Pigeons (*Columba fasciata*), Mountain Quail (*Oreortyx pictus*), Steller's Jay (*Cyanocitta stelleri*),

western gray squirrel (*Sciurus gresus*), mule deer, and black bear (*Ursus americanus*). Mule deer may also find substantial browse in these habitats, which are important to deer nutrition in migratory holding areas (Mayer et al. 1988).

Montane Hardwood

Steep-sided and rocky south-facing slopes at elevations ranging from 3,500 to 6,000 feet in elevation often support extensive stands of canyon live oak, and, at somewhat higher elevations, California black oak. Ponderosa pine, incense cedar, and white fir (*Abies concolor*) are sometimes associated with these stands. California rose (*Rosa californica*), snowberry (*Symphoricarpus albus* var. *laevigatus*), and sword fern (*Polystichum munitum*) frequently occur in the shaded understory of canyon live oaks. Bracken fern (*Pteridium aquilinum* var. *pubescens*) is often found in the understory of California black oaks. One of the best examples of montane hardwood may be seen on Lewis Creek along the short trail to Corlieu Falls, where canyon live oaks provide a nearly closed canopy on a steep east-facing slope. Small stands of California black oaks may be seen in the vicinity of Sierra Sky Ranch, Mudge Ranch, and along the Beasore and Mammoth Roads.

Montane Hardwood Conifer

This habitat is a closed canopy forest of the same species listed under "montane hardwood". It occurs at elevations ranging from 3,500 feet to 6,000 feet in elevation. It is differentiated from the montane hardwood by the mix of conifers (ponderosa pine, incense cedar, sugar pine, and white fir), which provide at least one-third of the canopy, to hardwoods (California black oaks and canyon live oaks) which also provide at least one-third of the canopy. This habitat is evident on the north side of Goat Mountain above Bass Lake, along portions of Highway 41 between Yosemite Forks and Fish Camp, and on both the Beasore and Mammoth Roads.

Montane Chaparral

Montane chaparral, like mixed chaparral of lower elevations, is dominated by shrubs of 1 to 10 feet in height. This plant association may occur on rocky south-facing slopes unsuited to the establishment of trees, or in a variety of other habitats recently disturbed by fire or logging. Snow bush ceanothus (*Ceanothus cordulatus*), bush chinquapin (*Castanopsis sempervirens*), pinemat manzanita (*Arctostaphylos nevadensis*), and greenleaf manzanita (*Arctostaphylos patula*) can cover extensive areas of the Sierra between 5,000 and 9,000 feet.

Montane chaparral can form a nearly impenetrable layer of shrubby vegetation that makes it ideal cover for many species of wildlife. Some species frequently encountered there are Californian ground squirrel, golden-mantled ground squirrel (*Spermophilus lateralis*), Poorwill (*Phalaenoptilus nuttallii*), Dusky Flycatcher (*Empidonax oberholseri*), and Green-tailed Towhee (*Pipilo chlorurus*). This is an important habitat for mule deer, providing forage and cover during the summer.

Mixed Conifer

Mixed conifer is a structurally diverse (many canopy layers), sometimes dense closed canopy forest which, in Madera County, occurs at elevations ranging from 4,000 feet to 6,000.feet Overstory species are generally confined to conifers like ponderosa pine, sugar pine, incense cedar, and white fir, but scattered California black oaks are not uncommon. In open mixed conifer forest understory species may include Pacific dogwood, mountain misery, deer brush, snow bush, and chinquapin. This habitat is evident in various

locations on Highway 41 between Cedar Valley and Fish Camp, along the Beasore Road, the Sky Ranch Road, and others above 4,000 feet in elevation.

The structural diversity of this habitat favors a diversity of wildlife, particularly birds. Approximately 110 species of birds, including many neotropical migrants (birds wintering in Mexico and Central America) breed in this and other forested habitats of the Sierra Nevada. Insect gleaning birds like Hermit and Yellow-rumped Warblers (*Dendroica occidentalis* and *D. coronata* respectively), Solitary and Warbling Vireos (*Vireo solitarius* and *V.gilvus*) forage in the tree tops, while species like Dusky Flycatchers, MacGillivary's Warblers (*Oporonis tolmei*), and Fox Sparrows (*Passerella illiaca*) forage in the shrub understory. Bird species that are resident, and must endure cold snowy winters include the Spotted Owl (*Strix occidentalis*), Northern Goshawk (*Accipiter gentilis*), White-headed Woodpecker (*Picoides albolarvatus*), Steller's Jay, Mountain Chickadee (*Parus gambeli*), and Red-breasted Nuthatch (*Sitta canadensis*). Squirrels found here include western gray squirrel, Douglas' squirrel (*Tamiasciurus douglasii*), long-eared chipmunk (*Tamias quadrimaculatus*), and northern flying squirrel (*Glaucomys sabrinus*).

White Fir

White fir forest occurs within the mixed conifer forest, frequently on north-facing slopes between 5,000 and 7,000 feet in elevation. White firs are the dominant, and in some cases only, tree species. White firs readily regenerate in their own shade, so dense thickets of young white firs are often intermixed with mature trees where fire has been excluded for many years.

Wildlife use of white fir habitats in Madera County is generally similar to that described for mixed conifer above. One difference is that white fir forest frequently lacks a well-developed shrub understory, such that animal species that forage or seek cover in shrubs may not be present.

Red Fir

The distribution of red fir forest in Madera County is limited to elevations of 7,000 to 9,000 feet. Red fir (*Abies magnifica*) is the dominant, and often only tree species present, although associates may include white fir, jeffrey pine (*Pinus jeffreyi*), and lodgepole pine (*Pinus murrayana*). On mesic (damp) north-facing slopes, stands of red firs can be dense. On drier slopes, this forest can be quite open with a well-developed shrub understory. Shrubs typical of this habitat include bush chinquapin, squaw carpet (*Ceanothus prostratus*), and pinemat manzanita. Red fir forest may be observed along the Beasore Road between the Chilkoot Lake Road and Beasore Meadows and along much of the Scenic Road from Muglers Meadow to McCreary Meadow.

As with white fir, wildlife use of this habitat is expected to be similar to that described for mixed conifer. Species commonly associated with this habitat include Black-backed Woodpecker (*Picoides arcticus*), Blue Grouse (*Dendragapus obscurus*), Golden-crowned Kinglet (*Regulus satrapa*) and marten (*Martes americana*).

Lodgepole Pine

In Madera County, Lodgepole pine forest is associated with meadow and creek margins, or high rocky terrain above the red fir forest. The distribution of this habitat is generally confined to elevations of 7,000 to more than 9,000 feet. Although sometimes occurring as nearly pure stands (particularly where this species is invading meadows), it may also be associated with red fir, quaking aspen (*Populus tremuloides*), western white pine (*Pinus monticola*) and mountain hemlock (*Tsuga mertensiana*). Understory species frequently

include bush chinquapin, pinemat manzanita, Sierra bilberry (*Vaccinium nivictum*), or, in mesic locations, low growing willows such as alpine willow (*Salix angelorum*). Examples of this habitat may be seen along Chiquito and Granite Creeks and in Clover Meadow.

Lodgepole pine forests, because of lower structural diversity, are generally lower in number of animal species than other forest types (Mayer et al. 1988). Some species however, are more common in lodgepole pine than other surrounding forest types such as Williamson's Sapsucker (*Sphyrapicus thyroideus*) and Red Crossbills (*Loxia curvirostra*).

Subalpine Conifer

Subalpine conifer, the wooded habitat of some of the highest elevations of eastern Madera County (9,500 to 11,000 feet), is an open woodland occurring in thin rocky soils. At the lower elevations, lodgepole pine, mountain hemlock, western white pine, and red firs provide a sparse cover. At the highest elevations, stunted wind-pruned hedges or mats (referred to as krummholz by botanists) of white bark pine may be found. The shrub and herb understory are sparse or lacking. Alpine willow, Sierra bilberry, red heather (*Phyllodoce breweri*), white heather (*Cassiope mertensiana*), short hair sedge (*Carex exserta*), and Parry's rush. This habitat is associated with the main crest of the Sierra, the Ritter Range, the Clark Range, and the high peaks on the eastern boundary of Yosemite National Park.

The subalpine conifer habitat, probably because of its harsher climatic conditions and the sparseness of the vegetation, is generally low in wildlife diversity. Species that do find this habitat suitable include Mt. Lyell salamander (*Hydromantes platycephalus*), Ruby-crowned Kinglet (*Regulus calendula*), pika (*Ochotona princeps*), and wolverine (*Gulo gulo*).

Alpine Dwarf-shrub

Alpine dwarf-shrub occurs above 10,000 feet in elevation. For the purposes of this discussion, it includes the alpine fell fields (rocky slopes) and snowbank margins described by Holland (1986). Resistant to intense cold, solar radiation, and dessicating summer winds, low-growing plants such as alpine willow, short-grass sedge, Parry's rush, and creeping penstemon (*Penstemon davidsonii*) have persisted at these extreme elevations. In Madera County, this habitat can be found above the subalpine conifer habitat described above.

Like Subalpine conifer habitats, alpine dwarf-shrub has a harsh climate, short growing season, and sparse vegetation. While these factors reduce the diversity of wildlife in this habitat, there are some species that are either unique to or occur in the highest numbers in alpine and subalpine habitats. These include Clark's Nutcracker (*Nucifraga columbiana*), Rosy Finch (*Leucosticte arctoa*) and alpine chipmunk (*Tamias alpinus*).

Wet Meadow

Wet meadows occur in eastern Madera County between 4,000 and 10,000 feet in elevation. Trees are generally absent from these meadows, except for occasional Fremont's cottonwoods, quaking aspens, and lodgepole pines (the latter colonize meadows at their margins). The dominant plants are perennial grasses (*Agrostis* sp., *Poa* sp., *Deschampsia* sp., *Calamagrostis* sp., *Oryzopsis* sp., *Trisetum* sp., *Danthonia* sp.), sedges (*Carex* sp.), and rushes (*Juncus* sp.). Corn lily (*Veratrum californicum*), meadow penstemon (*Penstemon rydbergii*), Jeffrey shooting star (*Dodecatheon jeffreyi*), bistort (*Polygonum bistortoides*), and primrose monkey flowers (*Mimulus primuloides*). Meadows may also support assorted willows (*Salix* sp.), Labrador tea (*Ledum glandulosum*), American laurel (*Kalmia polifolia*), and, at lower elevation meadows, western azalea (*Rhododendron occidentale*). Wet meadows of Madera County can readily be observed along

Willow Creek (Soquel and Texas Flat campgrounds), and along the Beasore Road at Beasore Meadow, Muglers Meadow, Jackass Meadow, and Clover Meadow.

Meadows and meadow edges support a number of wildlife species. Many insects breed in this moist habitat. They are preyed upon by such insectivores as Yosemite toad (*Bufo canorus*), pacific treefrog, and Willow Flycatcher (*Empidonax traillii*). The lush herbaceous vegetation provide food and cover for species like montane vole (*Microtus montanus*), mountain pocket gopher (*Thomomys monticola*), and Lincoln Sparrow (*Melospiza lincolnii*). Calliope Hummingbirds (*Stellula calliope*) are attracted by the large number of flowers that meadows provide. Predators often associated with this habitat include rubber boa (*Charina bottae*), western terrestrial garter snake (*Thamnophis elegans*), and Great Gray Owl (*Strix nebulosa*). Meadows are important to mule deer as fawning grounds. Human encroachment of these meadows may potentially affect deer populations.

Montane Riparian

Most montane creeks and rivers support a narrow band of riparian trees and shrubs. This narrow band widens along slower moving creeks lacking a deeply incised channel (a condition observed in broad meadows). Cottonwoods, willows, and aspen provide the tree overstory of many montane riparian habitats. Shrubby species could include western azalea, various willows, creek dogwoods (*Cornus* sp.), and mountain alder (*Alnus tenuifolia*). Associated with this habitat is one special status plant, the flaming trumpet (*Collomia rawsoniana*), which occurs principally along Willow Creek, Rock Creek, and Whiskey Creek, and their tributaries. Other creeks supporting a montane riparian association of vascular plants include Lewis, Big, Chiquito, and Jackass Creeks.

Though riparian areas are generally narrower in the montane portions of the county than at lower elevations, they still are important movement and migration corridors for mule deer and other wildlife. Species of birds typically associated with montane riparian include Yellow Warbler, Nashville Warbler (*Vermivora ruficapilla*) and Lazuli Bunting (*Passerina amoena*).

Riverine

The aquatic habitat of the many perennial creeks of Madera County may be considered riverine. Fringed by typical riparian plants, this habitat may support lush clumps of Indian rhubarb (*Peltiphyllum peltatum*) on rocky boulders or emergent vegetation in slack water. Mostly, however, seasonal high water associated with melting snow, has sufficient velocity to transport gravels, cobbles, and, in some cases, boulders, which severely scour channel beds. Therefore, montane stream beds are usually devoid of vegetation.

Riverine habitats of higher elevations of Madera County provide habitat for Spotted Sandpiper (*Actitis macularia*), American Dipper, and Mink (*Mustela vison*). The larger streams may be planted with rainbow trout and brown trout (*Salmo trutta*).

Lacustrine

A considerable number of lakes can be found at the higher elevations of eastern Madera County. Glacial in origin, these lakes are frozen and covered with snow during the winter and spring. Many are quite small, although the largest, such as Thousand Island and Garnet, each occupy several hundred acres. All natural lakes in Madera County are found above 7,000 feet in elevation. Numerous reservoirs, the largest of which are Bass Lake and Mammoth Pool, are located at lower elevations and usually do not freeze in the winter.

Mountain lakes are important sources of water for many wildlife species. The natural higher elevation lakes are important breeding habitat for the Yosemite toad. Bass Lake supports wintering populations of species such as Common Goldeneye (*Bucephela clangula*), Common Merganser, and occasionally Bald Eagles. Though originally not native, rainbow trout and eastern brook trout (*Salvelinus fontinalis*) have been planted in lakes capable of sustaining fish.

SENSITIVE BIOTIC RESOURCES

Special Status Plants and Animals

Several plant and animal species known to occur in Madera County have been given special status under federal or state endangered species legislation, or otherwise have been designated as "rare," "threatened," "endangered" or "species of special concern" by state resource agencies or professional organizations. Such species are collectively referred to as "species of special status." Impacts to them from agricultural operations and various kinds of development may be considered significant as discussed in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. The locations of several federal and state endangered species occurring in Madera County have been shown in Figures 6-12 and 6-13.

Federally-listed threatened and endangered species and their habitats are protected under provisions of the Endangered Species Act. Activities which may "take" actively or potentially used habitat are regulated by the Endangered Species Office of the U.S. Fish and Wildlife Service. Candidate species on Lists 1 and 2 also receive special attention from federal agencies during environmental review. Taxa for which the U.S. Fish and Wildlife Service has sufficient biological information to support a proposal to list as Endangered or Threatened are placed in Category 1. Taxa, the listing of which may be warranted according to existing information, but for which substantial biological information to support a proposed rule is lacking, are placed in Category 2. Some candidate species have been petitioned for federal listing. These species are often treated by resource agencies as if they were actually listed during the environmental review process. Most birds and their active nests are protected by the Federal Migratory Bird Treaty Act.

State-listed threatened and endangered species and their habitats are protected under provisions of California's Endangered Species Act. Activities which may "take" individuals and actively or potentially used habitat may be regulated by the California Department of Fish and Game.

The Department of Fish and Game has also produced three lists of "species of special concern." These lists serve as watch lists. Species on these lists either are of limited distribution or the extent of their habitats has been reduced substantially, such that a threat to their populations may be imminent. Thus, their populations should be monitored. They may receive special attention during environmental review, but do not have statutory protection.

Vascular Plants listed as rare or endangered by the California Native Plant Society (California Native Plant Society 1988), but which have no designated status under state endangered species legislation, are defined as follows:

List 1B. Plants Rare, Threatened, or Endangered in California and elsewhere.

List 2. Plants Rare, Threatened, or Endangered in California, but more numerous elsewhere.

List 3. Plants About Which We Need More Information - A Review List.

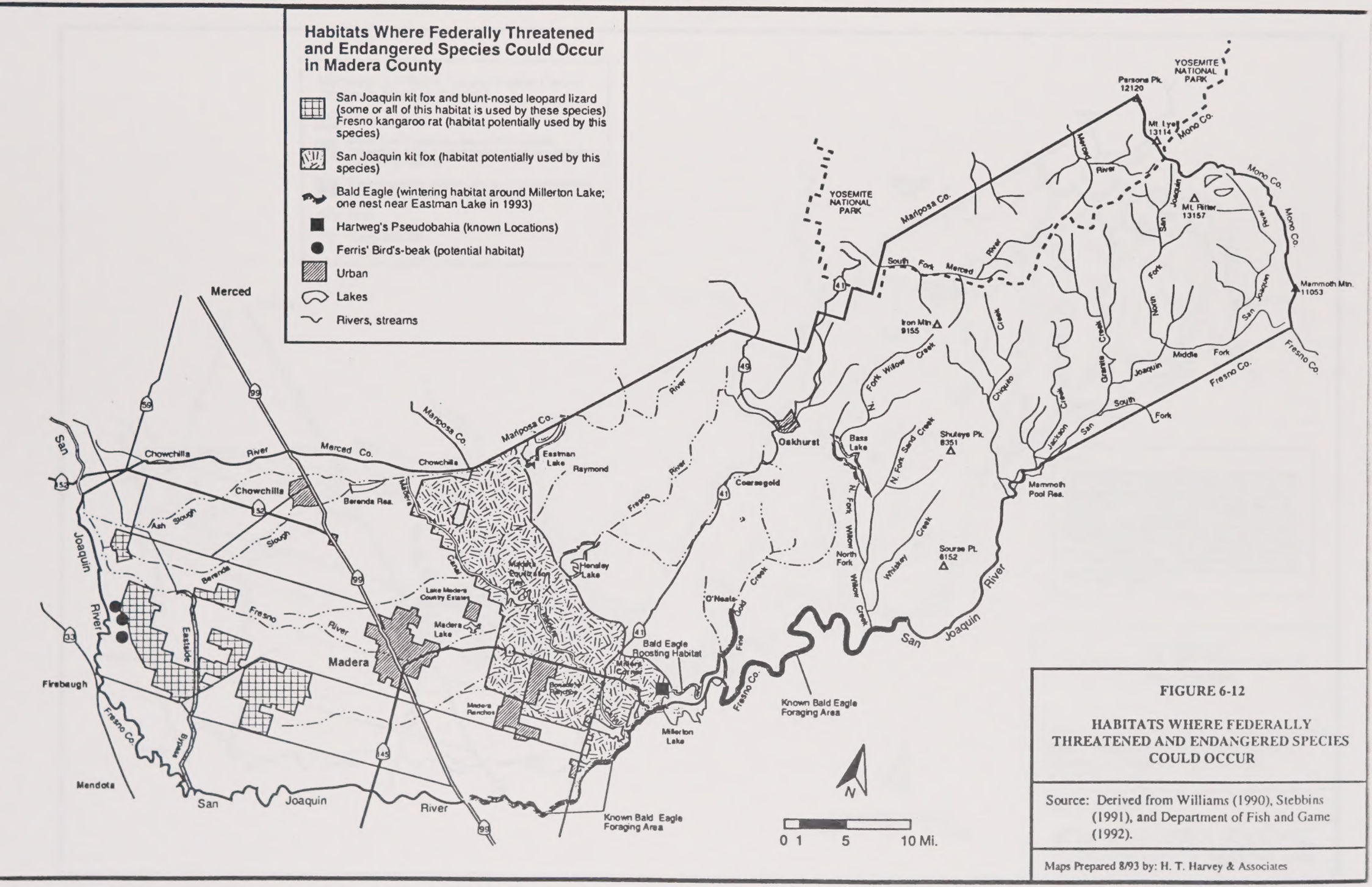
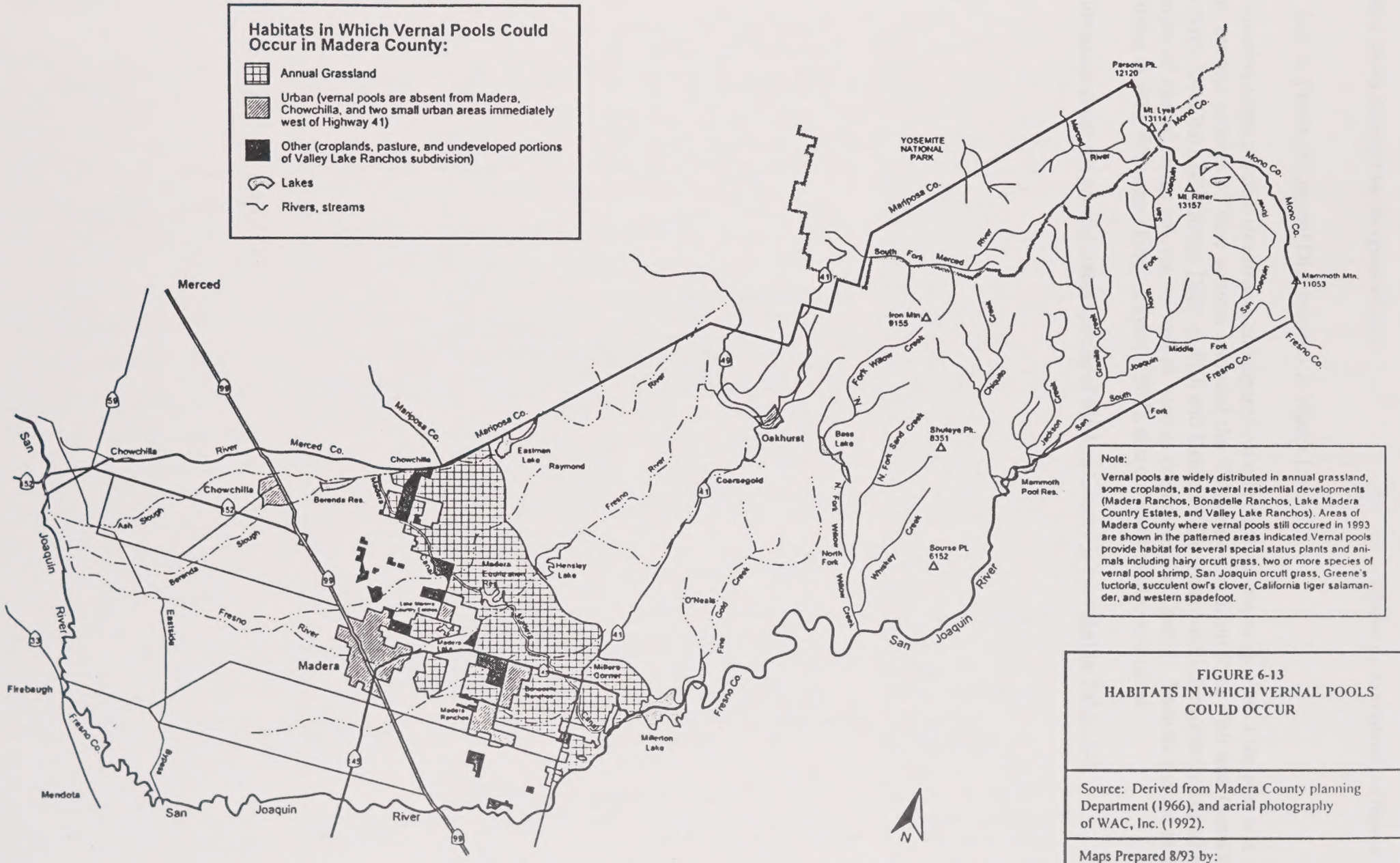


FIGURE 6-12

HABITATS WHERE FEDERALLY THREATENED AND ENDANGERED SPECIES COULD OCCUR

Source: Derived from Williams (1990), Stebbins (1991), and Department of Fish and Game (1992).

Maps Prepared 8/93 by: H. T. Harvey & Associates



Note:

Vernal pools are widely distributed in annual grassland, some croplands, and several residential developments (Madera Ranchos, Bonadelle Ranchos, Lake Madera Country Estates, and Valley Lake Ranchos). Areas of Madera County where vernal pools still occured in 1993 are shown in the patterned areas indicated.Vernal pools provide habitat for several special status plants and animals including hairy orcutt grass, two or more species of vernal pool shrimp, San Joaquin orcutt grass, Greene's tuctoria, succulent owl's clover, California tiger salamander, and western spadefoot.

FIGURE 6-13
HABITATS IN WHICH VERNAL POOLS COULD OCCUR

Source: Derived from Madera County planning Department (1966), and aerial photography of WAC, Inc. (1992).

Maps Prepared 8/93 by:

H.T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

List 4. Plants of Limited Distribution - A Watch List.

Information about possible threatened, endangered, or other special-status species of the area was collected from several sources. These sources included the California Department of Fish and Game's Natural Diversity Data Base (California Dept. of Fish and Game 1992). Data base information was gathered for a number of special status species, as well as various regions of the County. Various studies prepared by Stebbins (1991), Williams (1990), Taylor (1987), and others were also consulted.

Information about the special status species of Madera County is provided in Table 6-5.

Table 6-5: List of Special Status Species that could occur in Madera County			
Adapted from Zeiner et al. 1988			
Species	Status	Habitat	Distribution in California
ANIMALS			
Blunt-nosed Leopard Lizard *(Gambelia silus)*	FE,CE	Alkali scrub, sparse annual grasslands	Edges of southern San Joaquin Valley, scattered locations on the valley floor, including western Madera County
Bald Eagle *(Haliaeetus leucocephalus)*	FT,CE	Lakes, rivers, streams, bays and coastlines. Roosts in large trees next to water.	Breeds primarily in northern portion of state; winters through much of the state at lower elevations; Madera County locations: Millerton, Hensley, Eastman and Bass Lakes, San Joaquin River
Peregrine Falcon *(Falco peregrinus)*	FE,CE	Breeds on cliff faces, usually adjacent to forested or coastal habitats; may utilize many habitats during migration and winter	Uncommon breeder on coast and in Sierra Nevada; winters and migrates over much of the state; unpredictable and nomadic
Least Bell's Vireo *(Vireo bellii pusillus)*	FE,CE	Riparian habitats with thickets of willows or other dense shrubs	Scattered locations in coastal regions in Southern California. Formerly present in Madera County - probably extirpated from Central Valley
Fresno Kangaroo Rat *(Dipodomys nitratoides exilis)*	FE,CE	Desert soils Alkali Scrub; requires vegetated mounds with friable	Small, scattered and isolated pockets of alkali scrub communities in southern Merced County and western Fresno and Madera Counties
San Joaquin Kit Fox *(Vulpes macrotis mutica)*	FE,CT	Desert alkali scrub, annual grasslands; may forage in adjacent agricultural habitats	San Joaquin Valley and surrounding hills and valleys; known from western Madera County
Western Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*	CE	Requires dense, multi-canopied riparian forests	Breeds in Sacramento Valley and scattered desert rivers; probably no longer breeds in San Joaquin Valley; may be present during migration
Great Gray Owl *(Strix nebulosa)*	CE,FSS	Found in old-growth red fir, mixed conifer, and lodgepole pine habitats, always in association with wet meadows	In California, spotty distribution in Warner Mts. and Sierra Nevada south to Fresno County;
Willow Flycatcher *(Empidonax trailii)*	CE,FC2	Willow thickets associated with riparian habitats and montane meadows	Formerly more widespread, now breeds at middle elevations (2000 to 8000 ft) in the Cascade and Sierra Nevada Mts.; widespread during migration
Valley Elderberry Longhorn Beetle *(Desmocerus californicus dimorphus)*	FT	Requires mature elderberry shrubs	Central Valley of California; known Madera County locations are from Oakhurst, Coarsegold Cr. and the San Joaquin and Chowchilla Rivers
Giant Garter Snake *(Thamnophis gigas)*	FC1,CT	Fresh emergent wetlands, riparian systems of low gradient streams and occasionally rice fields	Floor of the Central Valley from near Chico in the north to central Fresno County; may be present on western edge of Madera County
Sierra Nevada Red Fox *(Vulpes vulpes necator)*	FC2,CT,FSS	Many montane habitats including alpine scrub, subalpine conifer, wet meadow, lodgepole pine, red fir, aspen, mixed conifer, montane chaparral and montane riparian	Higher elevations (generally above 4500 ft) of portions of Cascades and central Sierra Nevada Mts.; foxes found at lower elevations are likely to be from an introduced population of an eastern subspecies
California Wolverine *(Gulo gulo luteus)*	FC2,CT	Mostly open habitats above timberline, but also in forested habitats	Found in Klamath, Cascade and Sierra Nevada Mts.; generally found at high elevations (between 6400 and 10,800 ft.) in southern and central Sierra Nevada Mts.

Table 6-5: List of Special Status Species that could occur in Madera County			
Continued			
Species	Status	Habitat	Distribution in California
Swainson's Hawk *(Buteo swainsoni)*	CT	In Central Valley, uses open grasslands proximate to large trees, which serve as nesting sites; usually associated with riparian systems; may forage in some agricultural crops	Found primarily in the Central Valley south to Fresno County; suitable habitat in central and western Madera County may be found along portions the Chowchilla, Fresno and San Joaquin Rivers
Greater Sandhill Crane *(Grus canadensis tabida)*	CT	In Central Valley, may be found in fresh emergent wetlands, annual grasslands and agricultural lands, especially plowed fields of rice or corn	Breeds in the northeastern corner of the state, as well as farther north; winters primarily in the Central Valley south to Kings County
Bank Swallow *(Riparia riparia)*	CT	Requires steep stream or riverbanks with fine-textured or sandy soils for nest digging	Primarily found in Sacramento Valley and northeastern corner of the state; formerly present in Madera County along San Joaquin River
California Red-legged Frog *(Rana aurora draytonii)*	FPE,CSC	Inhabits quiet pools of streams, marshes and occasionally ponds, often with overhanging vegetation	Occurs west of the Sierra-Cascade crest and along the Coast Ranges the entire length of the state, usually below 3900 ft; though formerly present, it appears to have been extirpated from Madera County
Southwestern Pond Turtle *(Clemmys marmorata marmorata)*	FC2,CSC	Associated with permanent or nearly permanent water in a wide variety of habitats	Found in suitable habitats west of the Cascade-Sierra crest; populations south of the Mokelumne River are proposed for listing as endangered
California Tiger Salamander *(Ambystoma californiense)*	FPE,CSC	Found primarily in annual grasslands; requires vernal pools for breeding and rodent burrows for refuge	Endemic to the Central Valley and adjoining coastal valleys from Santa Barbara and Tulare Counties north to Butte County; known to occur in the vicinity of Millerton Lake in Madera County
Vernal Pool Fairy Shrimp *(Branchinecta lynchi)*	FT	Primarily found in vernal pools, may use other seasonal wetlands	Central Valley
Vernal Pool Tadpole Shrimp *(Lepidurus packardi)*	FE	Primarily found in vernal pools, may use other seasonal wetlands	Central Valley
Mt. Lyell Salamander *(Hydromantes platycephalus)*	FC2,CSC	Occurs in massive rock areas in mixed conifer, red fir, lodgepole pine, and subalpine habitats	Endemic to the Sierra Nevada Mts. from Sierra County south to Tulare County; from 4000 to 11,600 ft.
Yosemite Toad *(Bufo canorus)*	FC2,CSC	Most closely associated with wet meadows, but also found in seasonal ponds associated with lodgepole pine and subalpine conifer habitats	Endemic to the central high Sierra from El Dorado County south to Fresno County; from 6400 to 11,300 ft.
Foothill Yellow-legged Frog *(Rana boylei)*	FC2,CSC	Found in or near rocky streams in a variety of habitats including valley-foothill hardwood, ponderosa pine, mixed conifer, riparian, mixed chaparral and wet meadow	Found along the Coast Ranges south to Los Angeles, most of northern California west of the cascades, and the flanks of the Sierra up to about 6000 ft.; absent from the valley floor
Mountain Yellow-legged Frog *(Rana muscosa)*	FC2,CSC	In the Sierra, associated with streams, lakes and ponds in montane riparian, wet meadow, lodgepole pine and subalpine conifer	In high elevations (4500 to 12,000 ft.) in the Sierra Nevada, also San Bernardino, San Gabriel and San Jacinto Mts.

Table 6-5: List of Special Status Species that could occur in Madera County			
Continued			
Species	Status	Habitat	Distribution in California
White-faced Ibis *(Plegadis chihi)*	FC2,CSC	Found in fresh emergent wetland, shallow lacustrine waters, and muddy ground of wet meadow and irrigated, or flooded, pastures and croplands	Found in scattered locations including the Klamath Basin, Honey Lake, the Salton Sea, and the Central Valley; in Madera County, seen in flooded pasture and croplands on the western edge of the county
Fulvous Whistling Duck *(Dendrocygna bicolor)*	FC2,CSC	Associated with fresh emergent wetland, shallow lacustrine habitats and pastures	Only found regularly in Imperial Valley; rare along Colorado River and in the San Joaquin Valley; In Madera County, has been seen on the San Joaquin river west of the town of Mendota
Harlequin Duck *(Histrionicus histrionicus)*	FC2,CSC	Winters in coastal habitats; breeds along large turbulent montane rivers	In winter, found along the coast south to San Luis Obispo County; formerly nested in the central Sierras, from Tuolomne County south to Madera County; may no longer breed in the Sierra Nevada
Northern Goshawk *(Accipiter gentilis)*	FC2,CSC,FSS	Prefers middle and higher elevation of mature, dense conifer forests	In California, found in North Coast Ranges through the Klamath, Cascade, and Sierra Nevada Mts.
Ferruginous Hawk *(Buteo regalis)*	CSC	Frequents open grasslands, sagebrush flats, desert scrub, low foothills surrounding valleys, and fringes of pinyon-juniper habitats	Winters in California on the Modoc Plateau, Coast Ranges and Central Valley; in Madera County, found in grasslands as found at Little Table Mt.
Mountain Plover *(Charadrius montanus)*	FC2,CSC	Found in short grassland and plowed agricultural fields;	Winters in the Central Valley from Sutter County south; also in foothill valleys west of the San Joaquin Valley and the Imperial Valley
Black Tern *(Chlidonias niger)*	FC2,CSC	Found in fresh emergent wetlands; also forages over rice fields	Found in wetland areas of the Northeastern Plateau, the Salton Sea and the Central Valley; formerly more common in the San Joaquin Valley, may no longer breed there
California Spotted Owl *(Strix occidentalis occidentalis)*	FC2,CSC	Prefers dense, old-growth, multi-layered coniferous forests; mixed conifer, white fir, red fir, ponderosa pine, montane hardwood-conifer, and Douglas fir habitats may be used	Found in suitable habitat in the Cascade, Sierra Nevada, and portions of the Transverse and Peninsular Ranges
California Horned Lark (Eremophila alpestris actia)	CSC	Found in a variety of open habitats where trees and shrubs are absent; uses grassland, alkali scrub, agricultural and valley-foothill hardwood habitats	Breeds along the California coast from Sonoma County south, the central Coast Ranges and the San Joaquin Valley to the Sierra Nevada foothills; individuals seen in winter may be from other populations
Tricolored Blackbird *(Agelaius tricolor)*	FC2,CSC	Breeds near fresh water, preferably in emergent vegetation of tall dense cattails or tules, but also in thickets of blackberries or willows; forages in grasslands and croplands	Resident through most of the Central Valley and parts of the central coast and scattered locations in the Northeastern Plateau and desert regions
Mt. Lyell Shrew *(Sorex lyelli)*	FC2,CSC	Presumably found in moist habitats	Known from only a few locations in the vicinity of Mt Lyell, in Yosemite National Park
Spotted Bat *(Euderma maculatum)*	FC2,CSC	Found in a variety of habitats from arid desert and grassland to mixed conifer forest	In California, mostly found in foothill, mountain and desert regions of the southern region, but as far north as Lake Tahoe

Table 6-5: List of Special Status Species that could occur in Madera County			
Continued			
Species	Status	Habitat	Distribution in California
Osprey *(Pandion haliaetus)*	CSC	Associated strictly with large, fish-bearing waters; primarily in ponderosa pine through mixed conifer habitats	In summer, found in the northern portion of the state, the entire length of the coast, and the Sierra Nevada
Northern Harrier *(Circus cyaneus)*	CSC	Frequents meadows, grasslands, open rangelands, desert sinks, fresh and saltwater emergent wetlands; seldom found in wooded areas	Entire state excluding forested mountain regions
Sharp-shinned Hawk *(Accipiter striatus)*	CSC	Breeds in ponderosa pine, black oak, riparian deciduous, mixed conifer and Jeffrey pine; north facing slopes with plucking perches are critical; many habitats are used in winter	Entire state; in Madera County, breeds in the Sierras; found in winter in the valley
Cooper's Hawk *(Accipiter cooperii)*	CSC	Breeds in most of the wooded habitats found in the state; uses many habitats in winter	Entire state; in Madera County, breeds in the Sierras; found in winter in the valley
Golden Eagle *(Aquila chrysaetos)*	CSC	Typically frequents rolling foothills, mountain areas, sage- juniper flats and desert	Entire state; in Madera County, breeds in the Sierras; found in winter in the valley
Merlin *(Falco columbarius)*	CSC	Frequents grassland, coastlines, savannahs, lakes, wetlands, edges, and early successional stages; seldom found in wooded areas or deserts	In winter, occurs in most of western half of the state below 3900 ft.
Prairie Falcon *(Falco mexicanus)*	CSC	Distributed from annual grasslands to alpine meadows, but primarily associated with grasslands, savannahs and desert scrub; requires cliffs or rock outcroppings for nesting	Most of state excluding heavily forested areas; in Madera County, has bred on Little Table Mt. and other foothill locations
Long-billed Curlew *(Numenius americanus)*	CSC	In winter, uses coastal estuaries, upland herbaceous areas and croplands	Breeds on Northeastern Plateau; in winter found along coast and Central Valley
California Gull *(Larus californicus)*	CSC	In winter, uses estuarine, inter-tidal, pelagic, lacustrine, emergent wetlands, riverine, and croplands	Breeds near alkali and freshwater lacustrine habitats east of the Sierra Nevadas and Cascades; winters along coast and in Central Valley; in Madera County, known from Millerton Lake
Burrowing Owl *(Speotyto cunicularia)*	FC2	Resident of open, dry grassland and desert habitats, and in open shrub stages of pinyon-juniper and ponderosa pine habitats	Found in the Central Valley; also in coastal, Northeastern Plateau, Great Basin, and desert regions of the state; in Madera County, found in grassland areas west of Millerton Lake and other areas
Long-eared Owl *(Asio otus)*	CSC	Primarily in riparian habitats, also in dense live oak thickets and other dense stands of trees	Resident or winter visitant to most of the state, excluding the humid North Coast Ranges, the Cascades, and higher elevations of the Sierra Nevada Mts., and large portions of the south coast
Short-eared Owl *(Asio flammeus)*	CSC	Found in open areas without trees, such as annual and perennial grasslands, meadows, saline and fresh emergent wetlands, dunes, and irrigated lands	Breeds in Northeastern Plateau and Great Basin regions of the state; winters along entire coast and Central Valley and western Sierra Nevada foothills

Table 6-5: List of Special Status Species that could occur in Madera County

Continued

Species	Status	Habitat	Distribution in California
California Mastiff Bat *(Eumops perotis californicus)*	FC2,CSC	Occurs in many open semi-arid to arid habitats; requires crevices in tall cliffs with long vertical drops for roosting	Resident in southeastern San Joaquin Valley and coast ranges from Monterey County south, from the coast eastward to the Colorado desert
Sierra Nevada Snowshoe Hare *(Lepus americanus tahoensis)*	FC2,CSC	Primarily found in montane riparian with thickets of alders willows, and in stands of young conifers interspersed with chaparral, especially near meadows	Resident in Cascade Mts. in Del Norte and Siskiyou Counties south through the Sierra Nevada Mts. to Madera and Mono Counties
Sierra Nevada Mountain Beaver *(Aplodontia rufa californica)*	CSC	Typical habitat in Sierras is montane riparian; also in open brushy stages of most forest types; prefers open and intermediate-canopy closure with a dense understory near water	Found on the north coast and in the Klamath, Cascade and Sierra Nevada Mts.
Pacific Fisher *(Martes pennanti pacifica)*	FC2,CSC	Occurs in intermediate to large-tree stages of coniferous forests and deciduous-riparian habitats with a high percent of canopy closure	Uncommon resident of the Klamath, Cascade and Sierra Nevada Mts.
Moestan Blister Beetle *(Lytta moesta)*	FC2	Little is known about habitat requirements; it is known that larvae are parasitic on ground-nesting wasps	In central California from San Joaquin County south to Tulare County
Western Spadefoot *(Scaphoipus hammondii)*	CSC	Primarily occurs in grasslands, valley-foothill hardwood woodlands also used; requires vernal pools or other temporary wetlands for breeding	Found in Central Valley and surrounding foothills, and on coast from Pt. Conception south to border
California Horned Lizard *(Phrynosoma coronatum frontale)*	CSC	Occurs in valley-foothill hardwood, conifer and riparian habitats, as well as in pine-cypress, juniper and annual grassland habitats	Resident in the Central Valley and surrounding foothills, and on coast from Sonoma County south
San Joaquin Whipsnake *(Masticophis flagellum ruddocki)*	CSC	Found in a variety of arid lowland habitats	This subspecies can be found in the San Joaquin Valley and on the east side of the adjacent Coast Range
Common Loon *(Gavia immer)*	CSC	Found in estuarine and subtidal marine habitats as well as mountain lakes	In winter, found along entire length of coast, less common inland on large mountain lakes; In Madera County, known from Millerton Lake
American White Pelican *(Pelecanus erythrorhynchos)*	CSC	Occurs on large lakes, estuaries and salt ponds	In summer, found on large lakes on Northeastern Plateau, the Salton Sea and along the Colorado River; in winter, found in the San Francisco Bay through and into the Central Valley, where it formerly bred
Double-crested Cormorant *(Phalacrocorax auritus)*	CSC	Occurs on inland lakes, in fresh, salt and estuarine waters	Found the entire length of coast and in the Central Valley and on the Northeastern Plateau
Barrow's Goldeneye *(Bucephela islandica)*	CSC	Rare in winter, in estuarine, brackish, lacustrine and riverine waters	Rare in winter on central coast, San Francisco Bay, and a few inland locations in Northern California; in Madera County, known from the San Joaquin River near Friant and Bass Lake; formerly bred in Sierras

Table 6-5: List of Special Status Species that could occur in Madera County

Continued

Species	Status	Habitat	Distribution in California
Black Swift *(Cypseloides niger)*	CSC	Forage widely over many habitats; nests behind or adjacent to waterfalls or on sea cliffs above the surf	Scattered, local breeding populations occur in the Cascades, Sierra Nevada and other mt. ranges, as well as the central coast; locally, populations occur in Yosemite National Park
Vaux's Swift *(Chaetura vauxi)*	CSC	Coniferous forests, especially with snags with tall burned-out stubs	Breeds in the North Coast Ranges, the Cascades and the Sierra Nevada
Purple Martin *(Progne subis)*	CSC	Inhabits open forests, woodlands, and riparian habitats during breeding season	Rare breeder on coast and interior mountain ranges; absent from higher elevations of the Sierra Nevada Mts.
Yellow Warbler *(Dendroica petechia)*	CSC	Breeds in riparian woodlands from coastal and desert low- lands up to 8000 ft. in the Sierra Nevada; also in montane chaparral and open ponderosa pine and mixed conifer	Breeds in Northern California, the length of the coast, the White and Sierra Nevada Mts.; numbers declining in lowland areas
Yellow-breasted Chat *(Icteria virens)*	CSC	Breeds in valley-foothill riparian up to about 4800 ft., and up to 6500 ft in desert riparian habitats east of the Sierra Nevada	Rare throughout range; absent from the floor of the Central Valley, much of the desert, and the higher mountain ranges; in Madera County, known from Fine Gold Creek
Pale Big-eared Bat *(Plecotus townsendii pallescens)*	FC2	Found in all habitats except alpine and subalpine; most abundant in mesic habitats	Resident in much of the state, excluding high elevations and the humid coastal region of the northern and central parts of the state, where it is replaced by another subspecies
Pallid Bat *(Antrozous pallidus)*	CSC	Occurs in a variety of habitats, including grasslands, shrublands, woodlands, and forests; most common in dry open habitats with rocky areas for roosting	Throughout the state at low elevations excluding the northwest corner of the state and the Sierra Nevada
Western White-tailed Hare *(Lepus townsendii townsendii)*	CSC	Preferred habitats are sagebrush, subalpine conifer, juniper, alpine dwarf shrub, perennial grassland and wet meadow	Found in Warner Mts. and crest and east side of Cascade and Sierra Nevada Mts. from Oregon border south to Tulare and Inyo Counties
San Joaquin Pocket Mouse *(Perognathus inornatus inornatus)*	CSC	Occurs in dry, open grasslands or scrub areas on fine textured soils between 350 and 650 ft. in elevation	Resident of the Central and Salinas Valleys
American Badger *(Taxidea taxus)*	CSC	Most abundant in drier open stages of most shrub, forest and herbaceous habitats, with friable soils	Resident of entire state excluding the northwest corner
Black-shouldered Kite *(Elanus caeruleus)*	SP	Inhabits herbaceous and open stages of most habitats, mostly in cismontane California; rarely found away from agricultural areas	Resident of lowlands of the coast and Central Valley
Ringtail *(Bassariscus astutus)*	SP	Occurs in riparian habitats, and in brush stands of most forest and shrub habitats, at low to middle elevations	Resident of most of state excluding the floor of the San Joaquin Valley and the northeast corner of the state
Yuma Myotis*(Myotis yumanensis)*	FC2	Found mainly in open forests and woodlands with sources of water over which to feed	Found across the entire state below 11,000 feet except the Mojave and Colorado Deserts
Long-eared Myotis *(Myotis evotis)*	FC2	Found in all brush, woodland, and forest habitats from sea level to9,000 feet, but coniferous woodlands and forests are preferred	Found throughout cismontane California

Table 6-5: List of Special Status Species that could occur in Madera County

Continued

Species	Status	Habitat	Distribution in California
Fringed Myotis *(Myotis thysanodes)*	FC2	Optimal habitats include pinyon - juniper, valley foothill hardwood, and hardwood conifer, generally between 4,000 and 7,000 feet	Found throughout cismontane California
Long-legged Myotis *(Myotis volans)*	FC2	Most common in woodland and forest habitats above 4,000 feet. Also found chaparral and other scrub habitats	Found throughout cismontane California
Hartweg's pseudobahia *(Pseudobahia bahiifolia)*	FPE,CE CNPS list 1B	Occurs in annual grassland in pumice soils of the Rocklin series	Found only in the low foothills on the western side of the Sierra Nevada Mts.; in Madera County, in area east of Road 206 and west of Friant Dam
Palmate bird's beak *(Cordylanthus palmatus)*	FE,CE CNPS list 1B	Found in Alkali Desert Scrub	Occurs in the Central Valley from Yolo County south to Fresno County; may be extirpated from Madera County
Greene's tuctoria *(Tuctoria greenei)*	FC1,CR CNPSlist 1B	Associated with vernal pools	Found in Central Valley from Butte County south to Tulare County
Hairy orcutt grass *(Orcuttia pilosa)*	FC1,CE CNPSlist 1B	Associated with vernal pools	Found in Tehama, Stanislaus, Merced, and Madera Counties; in Madera County, known from vernal pools off of Highway 41 and near the Santa Fe railroad tracks along Avenue 15
San Joaquin Valley orcutt grass *(Orcuttia inaequalis)*	FC1,CE CNPSlist 1B	Associated with vernal pools	Found in Central Valley from Stanislaus County south to Tulare County; in Madera County, known from Vernal pools off of Highway 41
Bogg's Lake hedge-hyssop *(Gratiola heterosepala)*	FC2,CE CNPS list 1B	Associated with vernal pools	In Madera County, known from Kennedy Table
Succulent owl's clover *(Orthocarpus campestris var. succulentus)*	FC2,CE CNPS list 1B	Associated with vernal pools	Found along the eastern side of the San Joaquin Valley and adjacent foothills; in Madera County, known from near Highway 41 and 145 and near Daulton
Flaming trumpet *(Collomia rawsoniana)*	FC1 CNPS list 1B	Associated with montane riparian habitats	Found only in Madera Counties; known from Nelder and Willow Creeks; once present in tributaries of Willow Creek near Bass Lake, habitat altered by residences
Bolander's clover *(trifolium bolanderi)*	FC2 CNPS list 4	Associated with Montane Meadows	Limited in distribution to the central Sierra Nevada
Hoover's calycadenia *(Calycadenia hooveri)*	FC1 CNPS list 1B	Associated with rocky places in annual grasslands	Limited in distribution to the lowest foothills of the Sierra Nevada
Mariposa pussypaws *(Calyptridium pulchellum)*	FC1 CNPS list 1B	Occurs in interior live oak woodland as low as 2300 ft. in elevation in loose gravelly soils associated with exfoliating granite outcrops	Known only from six locations in Mariposa, Madera and Fresno Counties; in Madera County, known from Indian Lake Estates near Coarsegold and from near Ahwahnee
Mono Lake lupine *(Lupinus duranii)*	FC2 CNPS list 1B	Associated with subalpine conifer and Great Basin desert scrub habitats; associated with dry volcanic pumice soils	Known from Mono County; possible in Madera County
Orange lupine *(Lupinus citrinus)*	FC1 CNPS list 1B	In association with gravelly soils associated with exfoliating granite outcrops between 2000 and 3000 ft.	Mariposa, Madera and Fresno Counties; in Madera County, known from Indian Lakes Estates near Coarsegold

Table 6-5: List of Special Status Species that could occur in Madera County			
Continued			
Species	Status	Habitat	Distribution in California
PLANTS			
Yosemite lewisia *(Lewisia disepela)*	FC3c CNPS list 1B	Found in coniferous forests in lower montane habitats with decomposing granite soils of rock outcrops or domes	Found in the Central Sierra Nevada
Yosemite wooly sunflower *(Eriophyllum nubigenum)*	FC2 CNPS list 1B	Upper montane coniferous forests and montane chaparral	Found in the Central Sierra Nevada
Yosemite ivesia *(Ivesia unguiculata)*	CNPS list 1B	Wet meadows	Found in the Central Sierra Nevada
Heartscale (*Atriplex cordulata*)	FC2	Alkali Desert Scrub	Potential in portions of the Western County. No Known populations, however.
Beaked Clarkia (*Clarkia rostrata*)	FC2	Oak woodlands with grassy understory	Possible in suitable habitat, but no known Madera County occurances
Ewan's Larkspur (*Delphinium hansenii ssp. evanianum*)	CNPS List 4	Oak woodlands with well drained rocky soils	Population very local, possible in foothills - elevation 60-600 ft.

STATUS CODES

FE	Federally Endangered
FT	Federally Threatened
FC1	Federal candidate, category 1
FC2	Federal candidate, category 2
FSS	Federal (BLM and USFS) sensitive species
CE	California Endangered
CT	California Threatened
CR	California Rare
CSC	California state species of special concern
SP	Fully protected species in the state of California
CNPS	California Native Plant Society

Jurisdictional Waters

Drainage channels and their impoundments are considered to be both Waters of the United States and the state of California (Department of Defense 1986). These waters are subject to the jurisdiction of the U.S. Army Corps of Engineers (Corps) according to provisions of the Section 404 of the Clean Water Act. Jurisdictional drainages include any incised channels which may carry a permanent, intermittent, or ephemeral flow of water. These channels may or may not be navigable. All that is required to establish state or federal jurisdiction is that a defined channel be present. The U.S. Army Corps of Engineers has jurisdiction over that portion of each channel defined by ordinary high water marks on opposing channel banks. Ordinary high water can be identified by shelving, scour lines, drift lines, and exposed roots. The California Department of Fish and Game has jurisdiction over any stream or lake as defined in the State Resources Code (Sections 1.56 and 1.72). The Department considers seasonal or ephemeral streams to be designated waters for purposes of notification pursuant to *Fish and Game Code Sections 1600 et seq.* This state law requires notification of the Department in advance of beginning projects that substantially divert, obstruct, or change the natural flow or the bed, bank, or channel of any stream or lake designated by the Department.

Wetlands are also considered to be Waters of the United States. Wetlands are habitats in which soils are intermittently or permanently saturated or inundated. The resulting anaerobic conditions in these soils select for plant species adapted to those conditions. Plant species showing a high degree of fidelity to soils intermittently or permanently saturated or inundated are referred to as hydrophytes. The physical appearance of wetland habitats varies considerably from the open water of a river to the seasonal ponding of alkaline flats, and generally includes swamps, bogs, marshes, vernal pools, riparian woodlands, and other similar areas, each supporting a flora, the dominant species of which are hydrophytes. Due to the seasonal nature of rainfall in California, some wetlands may experience soil saturation for only a few weeks out of the year. Wetlands are identified by the presence of hydrophytic vegetation, hydric soils, and wetland hydrology according to methodologies outlined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands.*

The discharge of fill into waters of the U.S. (including wetlands), or the removal of riparian vegetation, is regulated by the U.S. Army Corps of Engineers and the California Department of Fish and Game. Where these waters provide habitat for federally endangered species, the U.S. Fish and Wildlife Service may also have permit authority. One or more permits are usually required to grade or fill any portion of rivers, creeks (including seasonal creeks), riparian habitats, vernal pools, seasonally wet alkaline desert scrub and grassland, fresh emergent wetlands, and montane meadows.

Sensitive Biotic Habitats

Sensitive biotic habitats are those which once were common but are now of limited extent due to agricultural and urban development. These habitats may be especially rich in botanical and wildlife resources, or, support large numbers of special status plants and animals. Continued development of these habitats will significantly affect the wildlife species using them, and in some cases, lead to their extirpation in Madera County.

Riparian Habitats

Of all the biotic habitats of Madera County, riparian habitats are used by the greatest diversity of terrestrial vertebrates. This remains so, even though these habitats are much reduced in size from their former extent, their linear extent has been fragmented by roads and residential development, the rivers and streams which

feed them are dry through much of every year, and grazing has altered their structure. Twenty-five species of reptiles and amphibians use these habitats. Western pond turtles, once widespread in the Central Valley, are now confined to foothill streams and associated riparian habitat. Most amphibians are dependent on aquatic, and associated riparian habitats, for breeding. More than 140 species of birds occur in riparian habitats. Many are riparian obligates. More than 50 species of mammals use these habitats. Most are dependent on its aquatic resources for drinking water. Many find cover, forage, and breed here. A great diversity of birds and mammals depend on rivers, streams and their associated riparian habitats as movement corridors.

Riparian vegetation was once extensive along portions of the Chowchilla, Fresno, and San Joaquin Rivers. It also occurred along many seasonal water courses below the foothills of the Sierra. Riparian habitats are now much diminished in size and extent. Katibah estimates that 11 percent of the pre-settlement riparian forest of the entire Central Valley remains today (1981). One study estimates that only 6 percent of the original riparian habitat occurring along the upper San Joaquin River remains today (Counties of Madera and Fresno, City of Fresno 1986). Of the remaining riparian forest in the Central Valley of California, it is estimated that 48 percent is in a disturbed or degraded condition (Katibah 1981). Dams are located on the Chowchilla, Fresno, and San Joaquin Rivers and most water once available to lush riparian habitats is now diverted to croplands, orchards. and vineyards via irrigation canals. Groundwater pumping has lowered water tables with concomitant adverse effects on remaining riparian vegetation. Grazing has eliminated the shrub understory of some riparian habitats.

Riparian habitats are now confined to narrow discontinuous corridors along the San Joaquin River, portions of the Fresno River below Hensley Dam, a short stretch of the Chowchilla River below Buchanan Dam, and various seasonal drainages. Yet they are critical to the continued presence of diverse wildlife resources found in Madera County, from the San Joaquin Valley to the crest of the Sierra.

Northern Hardpan Vernal Pools

Northern hardpan vernal pools are distributed throughout the remaining annual grasslands, some croplands, and urban areas of the county (see Figure 6-13). These pools, and their unique flora, were once common to the eastern Central Valley from Tulare County in the south to Shasta County in the north. Holland (1978) estimated that approximately 12 percent of the vernal pool habitat once extant in the Central Valley remained in 1979. The number of pools remaining is almost certainly less in 1993. In Madera County, most of the annual grasslands with vernal pools have been converted to cropland, orchards, vineyards, and residential development. Vernal pools may still be found in subdivisions such as Madera Ranchos, Bonadelle Ranchos, Lake Madera Country Estates, and Valley Lake Ranchos (the last is largely undeveloped), although many have been filled.

Continuing development of vernal pool habitats will result in a continuing decline of plants and animals endemic to them. As previously mentioned, many plant and animals species dependent on vernal pools have been afforded special status by federal and state resource agencies. The California tiger salamander is being considered and two species of freshwater shrimp have been recently listed as federally-endangered. San Joaquin orcutt grass, hairy orcutt grass, and Greene's Tuctoria, and succulent owl's clover are candidates for listing as federally endangered (the latter species has been listed as state-threatened). The western spadefoot has been listed as a species of special concern. Vernal pools provide important wintering habitat for a variety of waterbirds. Additional losses of critical habitat for vernal pool plants and animals, and the fragmentation of now continuous tracts of habitat by leapfrog development, will jeopardize their continued existence in Madera County.

Alkaline Desert Scrub

Alkali scrub and alkali grasslands provide habitat for a number of federally protected animals. The San Joaquin kit fox, blunt-nosed leopard lizard, and Fresno kangaroo rat are federally protected species which will be extirpated from the county if their remaining habitat is converted to other uses.

Fresh Emergent Wetlands

Fresh emergent wetlands are especially important habitats to wildlife. More than 160 species of birds use such wetlands as wintering, breeding, and foraging habitat. Wetland losses in recent years have been substantial. As wetlands have been filled for agriculture and residential development, avian populations dependent on these wetlands have declined. Thus, the Tricolored Blackbird, Long-billed Curlew, White-faced Ibis, and Greater Sandhill Cranes have all been given special status by state and federal resource agencies. Continued losses of this habitat will significantly jeopardize the continued occurrence of these species in the county.

Wet Meadows

Most wet meadows occur within U.S. Forest Service jurisdiction. Portions of Arnold, Beasore, and Jackass Meadows are privately-owned. Important to amphibians, insectivorous birds which forage from their edge, small mammals, predators which prey on small mammals, and deer which fawn in them, meadows are sensitive habitats of limited extent. Preservation of the resource values associated with meadows preserves the overall biotic diversity of montane forests.

Oak Woodlands

It is estimated that since the 1940s over a million acres of oak woodland habitat have been lost in California (Pavlik et al. 1991). Between 1945 and 1973 alone, oak woodlands were reduced in California by approximately 890,000 acres (Bolsinger 1988). The major cause of oak woodland loss during this time period was rangeland clearing (Bolsinger 1988). Blue oak was the major oak woodland type lost. Since the early 1970s residential and commercial development has become the major cause of oak woodland habitat loss, with blue oak woodland bearing the brunt of the impact. Next to blue oak, valley oak has been the major oak woodland type lost during this period (Bolsinger 1988).

In 1988, Bolsinger reported that an estimated 279,000 acres of oak woodland were in the process of being converted to residential, commercial, and industrial uses. Of this total, 160,000 acres were dominated by blue oak, 50,000 acres by coast live oak, and 34,000 acres by valley oak. If California's population continues to grow as currently projected, it is estimated that by the year 2,010, 250,000 acres of oak woodland will be lost to development (Pavlik et al. 1991).

Regeneration of blue and valley oak has been poor to non-existent throughout much of their ranges for the past 75 to 100 or more years (Bolsinger 1988, Bartolome et al. 1987) The noticeable lack of valley and blue oak saplings and small trees within the habitats where these species occur suggests that current stand densities and distributions of these species will not be maintained in the future (McCreary 1990), even if active habitat destruction does not occur.

It should be noted that due to loss of habitat and lack of regeneration, valley and blue oak have been identified as oak species of special concern (Pavlik et al. 1991). The California Native Plant Society includes valley oak on its watch list (Smith and Berg 1988).

Valley oak riparian forest, blue oak woodland, blue oak-digger pine, and montane hardwood are all plant associations of Madera County in which oaks are the dominant tree. Much of the development of eastern Madera County has occurred in oak woodlands. Due to their importance to a variety of wildlife species, and due to statewide concern over their future existence, protection of oak woodlands and the resource values they provide has become a priority of some state and federal resource agencies.

Other Sensitive Biotic Resources

Oakhurst Deer Herd

One migratory deer herd spends part of each year on private lands of Madera County. The Oakhurst deer herd winters around Bass Lake and in the Oakhurst Basin, moving to higher elevations on Raymond Mountain, Fresno Dome, and Shuteye Peak during the summer (Peabody 1984). The Raymond deer herd, which occurs south of Deadwood Peak is a resident herd. Migratory deer require large contiguous tracts of winter range with abundant browse and unobstructed movement corridors between their winter and summer ranges. Since 1961, the population of the Oakhurst deer herd has declined an estimated 80 percent. Reasons for the decline include the suppression of wild fire needed to stimulate the growth of browse, the urbanization of large areas of the Oakhurst basin formerly providing critical winter range, predation of deer by dogs and mountain lions, poaching, highway mortality, and fawn losses which are not well understood by biologists. The continued viability of the Oakhurst deer herd will depend on the continued availability of winter range and relatively unobstructed movement corridors.

Significant Natural Areas

The Significant Natural Areas Program was established by the California State Legislature in 1981 (Department of Fish and Game 1992). The mandates of the program were to:

(1) Develop and maintain a data management system for natural resources;
(2) Identify the most "significant natural areas" in California;
(3) Ensure recognition of these areas;
(4) Seek long-term perpetuation of these areas;
(5) Coordinate with other public agencies and private organizations interested in protecting natural areas.

Significant natural areas include:

(1) Areas supporting extremely rare species or natural communities;
(2) Areas supporting associations or concentrations of rare species or communities;
(3) Areas exhibiting representative examples of common or rare communities;
(4) Areas of high species-richness or habitat-richness.

Areas identified by this program may occur on public or private lands, but have no legal status. However, identification of natural areas as "significant" provides land use planners in local, state, and federal jurisdictions with additional information important in to the formulation of land use plans.

Eight Significant Natural Areas have been identified in Madera County. These are shown in Table 6-6 below. Three of these areas have been discussed in some detail elsewhere in this section.

TABLE 6-6

SIGNIFICANT NATURAL AREAS IN MADERA COUNTY

Name of Area	Jurisdiction	Biotic Elements of Interest	Legal Status
Little Table Mountain West	Private	Northern Hardpan Vernal Pool	None
		California Tiger Salamander (*Ambystoma californiense*)	FPE;FC1/CSC
		San Joaquin Orcutt Grass (*Orcuttia inaequalis*)	FC1/SE
		Succulent Owl's Clover (*Orthocarpus campestris* var. *succulentus*)	FC2/SE
Little Table Mtn. Southwest	Private	Northern Hardpan Vernal Pool	None
		San Joaquin Orcutt Grass (*Orcuttia inaequalis*)	FC1/SE
		Hairy Orcutt Grass (*Orcuttia pilosa*)	FC1/SE
		Succulent Owl's Clover (*Orthocarpus campestris* var. *succulentus*)	FC2/SE
Indian Lake Estates	Private	Orange Lupine (*Lupinus citrinus*)	FC2/none
		Mariposa Pussypaws (*Cistanthe pulchella*)	FC2/none
Pine Grove Mine	Sierra National Forest	Sensitive Information Special Animal	None/SE
Ahwahnee	Private	Mariposa Pussypaws (*Cistanthe pulchella*)	FC2/none
Firebaugh Sacaton Grassland	Private	Valley Sacaton Grassland Valley Sink Scrub	none/none none/none
		Blunt-nosed Leopard Lizard (*Gambelia silus*)	FE/SE
		San Joaquin Kit Fox (*Vulpes macrotis mutica*)	FE/SE
		Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)	FE/SE
Buena Vista Peak	Yosemite National Park	Great Gray Owl (*Strix nebulosa*)	None/SE
Stairway Creek		Paiute Cutthroat Trout	FT/none

6.7 AIR RESOURCES

AIR BASIN CLIMATOLOGY

The amount of a given pollutant in the atmosphere is determined by the amount of pollutant released and the atmosphere's ability to transport and dilute it. The major factors affecting transport and dilution are terrain, wind, atmospheric stability, and, for photochemical pollutants, sunshine.

Madera County is entirely within the eight-county San Joaquin Valley Air Basin. This air basin is a well-defined climatic region, primarily because of the topographic barriers which form distinct boundaries on three sides of the basin. The western boundary is formed by the Coast Range, the southern boundary by the Tehachapi Mountains, and the eastern boundary by the Sierra Nevada. Only the northern boundary is not marked by a distinct topographic feature. At the northern end of the basin is the Carquinez Strait, a sea level gap between the Coast Ranges that extends to the west and is a major source of ventilation.

The topography of Madera County is varied, resulting is large climatic differences within the county. The western half of the county lies within the low, flat San Joaquin Valley. This portion of the county is characterized by hot summers and mild winters. The San Joaquin Valley floor is quite arid due to a rain "shadow" created by the series of coast mountain ranges separating the valley from the Pacific Ocean.

There are no permanent wind monitoring sites within Madera County. Winds within the western portions county, however, can be characterized using data from nearby stations outside the county. Table 6-7 shows wind speed and direction frequencies from the Fresno Air Terminal, located about 10 miles south of the Madera County line. Winds from the northwesterly quadrant are the most frequent and strongest on average. Northwesterly winds dominate during the spring and summer months and show a strong daily variation. The highest average windspeeds occur in the afternoon and evening hours, while the lightest occur in the night and morning hours. During fall and winter, northwesterly winds still predominate, but wind direction is more variable, and calm conditions are more frequent. Table 6-7 shows that a secondary maxima for wind direction and wind speed exists for southeast winds; this is the prevailing wind direction associated with winter storms.

Climate in the eastern portion of the county differs dramatically from the western portion. The eastern portion of the county is the western slopes of the Sierra Nevada; the eastern boundary of the county is the crest of the Sierra Nevada range. The deeply incised canyon of the San Joaquin Valley dominates the southern portions of the county.

The elevation and slope of this portion of the county results in a much cooler and wetter climate compared to that of the valley floor. Precipitation is heavy in the winter months, with deep snowfall at the higher elevations. Winds in mountainous terrain are far more variable, in both speed and direction, than at the valley floor. Wind direction is typically up-slope during the daytime and downslope at night. The overall general wind is westerly, although terrain effects can distort this general flow substantially. During the fall months strong easterly winds, known as "Mono Winds," occur for short periods.

TABLE 6-7

WIND DIRECTION FREQUENCIES AND AVERAGE SPEED
Fresno Air Terminal

Wind Direction	Frequency (%)	Average Speed (Knots*)
N	4.0	4.2
NNE	1.6	3.9
NE	3.5	3.7
ENE	3.1	4.0
E	5.7	4.2
ESE	4.7	5.0
SE	7.2	5.6
SSE	4.2	5.5
S	4.3	4.9
SSW	2.5	4.5
SW	3.5	4.2
WSW	2.5	4.7
W	6.1	5.6
WNW	14.5	7.5
NW	21.6	7.3
NNW	5.9	5.6
Calm	5.1	---

*knots = 1.15 miles per hour

Source: California Department of Water Resources, 1978

AIR QUALITY STANDARDS

The Environmental Protection Agency (EPA) has set national ambient air quality standards for pollutants determined to be injurious to public health or welfare. There are both primary and secondary ambient air quality standards. Primary standards are designed to protect public health, with a margin of safety. Secondary standards are designed to protect public welfare, in addition to health, and are therefore more stringent than primary standards.

A state may adopt more stringent standards than those required by the federal government. The State of California has established health-based ambient air quality standards that are more stringent than the federal standards.

Federal and state standards have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulates (PM-10), and lead. California has also set standards for pollutants not covered by national standards (sulfates, hydrogen sulfide, vinyl chloride, visibility reducing particles). The state and federal primary standards for major pollutants are shown in Table 6-8.

TABLE 6-8

FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Primary Standard	California Standard
Ozone	1-Hour	0.12 PPM	0.09 PPM
Carbon Monoxide	8-Hour	9.0 PPM	9.0 PPM
	1-Hour	35.0 PPM	20.0 PPM
Nitrogen Dioxide	Annual	0.05 PPM	---
	1-Hour	---	0.25 PPM
Sulfur Dioxide	Annual	0.03 PPM	---
	24-Hour	0.14 PPM	0.05 PPM
	1-Hour	---	0.25 PPM
Suspended Particulates	Annual	50 ug/m3	30 ug/m3
	24-Hour	150 ug/m3	50 ug/m3
Lead	30-Day Avg.	---	1.5 ug/m3
	3-Month Avg.	1.5 ug/m3	---

PPM = Parts Per Million
ug/m3 = Micrograms per Cubic Meter

CURRENT AIR QUALITY

The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) and California Air Resources Board (ARB) operate a network of air quality monitoring site within the San Joaquin Valley Air Basin, including one in the city of Madera that measures ozone and PM-10.

A summary of air quality data for the Madera monitoring site from 1987 to 1991 is shown in Table 6-9. The data shown includes annual maximum concentrations, the number of days that the state or federal air quality standards were exceeded, and annual statistics for PM-10.

Table 6-9 shows that the standards for ozone and PM-10 are currently exceeded in Madera County. Both pollutants are regional problems affecting the entire San Joaquin Valley Air Basin.

TABLE 6-9

AIR QUALITY DATA FOR MADERA
1987-1991

Parameter	1987	1988	1989	1990	1991
Ozone					
Maximum 1-Hour Concentration, PPM	-	13	12	11	13
Days Above Federal 1-Hour Standard	-	1	0	0	2
Days Above State 1-Hour Standard	-	11	15	6	24
PM-10					
Maximum 24-Hour Concentration, ug/m3	99	96	162	174	118
Days Above Federal 24-Hour Standard	0	0	4	5	6
Days Above State 24-Hour Standard	21	26	25	23	2
Annual Geometric Mean	44.5	46.2	47.6	43.4	42.4
Annual Arithmetic Mean	48.2	52.0	54.4	52.5	51.7

PPM = parts per million
ug/m3 = micrograms per cubic meter

Source: California Air Resources Board, 1988-1992

HEALTH EFFECTS OF POLLUTANTS

The primary air quality problems in Madera County are ozone and suspended particulates (PM-10). The following is a discussion of the health effects of these important pollutants.

Ozone

Ozone is produced by chemical reactions, involving nitrogen oxides (NOx) and reactive organic gases (ROG), that are triggered by sunlight. Nitrogen oxides are created during combustion of fuels, while reactive organic gases are emitted during combustion and evaporation of organic solvents. Since ozone is not directly emitted to the atmosphere, but is formed as a result of photochemical reactions, it is considered a secondary pollutant. In the San Joaquin Valley Air Basin, ozone is a seasonal problem, occurring roughly from April through October.

Ozone is a strong irritant that attacks the respiratory system, leading to the damage of lung tissue. Asthma, bronchitis and other respiratory ailments as well as cardiovascular diseases are aggravated by exposure to ozone. A healthy person exposed to high concentrations may become nauseated or dizzy, may develop headache or cough, or may experience a burning sensation in the chest.

Research has shown that exposure to ozone damages the alveoli (the individual air sacs in the lung where the exchange of oxygen and carbon dioxide between the air and blood takes place). Research has shown that ozone also damages vegetation.

PM-10

PM-10 is small suspended particulate matter, 10 microns or less in diameter, which can enter the lungs. The major component of PM-10 are dust particles, nitrates, and sulfates. PM-10 is directly emitted to the atmosphere as a by-product of fuel combustion and wind erosion of soil and unpaved roads. Small particles are also created in the atmosphere through chemical reactions.

Particles greater than 10 microns in diameter can cause irritation in the nose, throat, and bronchial tubes. Natural mechanisms remove much of these particles, but particles less than 10 microns in diameter are able to pass through the body's natural defenses and the mucous membranes of the upper respiratory tract and enter into the lungs. The particles can damage the alveoli, tiny air sacs responsible for gas exchange in the lungs. The particles may also carry carcinogens and other toxic compounds, which adhere to the particle surfaces and can enter the lungs.

AIR POLLUTANT SOURCES

Madera County contains a multitude of air pollutant sources. Sources of pollutants have been identified, classified and quantified by the ARB and other agencies to identify how much reduction in emissions will be needed to meet the ambient air quality standards. Tables 6-10 and 6-11 show the most recent emissions inventories for Reactive Organic Gases (ROG) and Nitrogen Oxides (NOx), respectively. These two pollutants are the primary precursors of ozone. Table 6-12 shows the emission inventory for PM-10.

Table 6-10 shows that sources of ROG and many and varied. On-road vehicles (a mobile source) are the single largest source, although mobile sources as a whole are a smaller source than stationary sources.

Table 6-11 shows that mobile sources are the predominant source of NOx in Madera County, with industrial processes and fuel combustion making a small contribution.

Table 6-12 shows that there are several substantial sources of PM-10 in the county. The major sources are farming operations and road dust from paved and unpaved roads. Unlike ozone precursors, automobile exhaust is not a major source for PM-10.

TABLE 6-10

ROG EMISSION INVENTORY FOR MADERA COUNTY

	Average Daily Emissions (Tons/Day)	% of Total
Stationary Sources		
Fuel Combustion	0.2	1.2%
Waste Burning	0.7	4.2%
Solvent Use	3.8	22.6%
Petroleum Processing, Storage and Transport	0.4	2.4%
Industrial Processes	0.9	5.4%
Pesticide Application	2.8	16.7%
Farming Operations	-	-
Construction and Demolition	-	-
Entrained Road Dust- Paved	-	-
Entrained Road Dust- Unpaved	-	-
Unplanned Fires	0.2	1.2%
Natural Sources	-	-
Total Stationary Sources	**9.0**	**53.6%**
Mobile Sources		
On-Road Vehicles	5.6	33.3%
Off-Road Vehicles	0.4	2.4%
Trains	0.6	3.6%
Aircraft	-	-
Mobile Equipment	0.9	5.4%
Utility Equipment	0.3	1.8%
Total Mobile Sources	**7.8**	**46.5%**
Grand Total	**16.8**	**100.0%**

Note: percentages may not equal 100 due to rounding

TABLE 6-11

NOx EMISSION INVENTORY FOR MADERA COUNTY

	Average Daily Emissions (Tons/Day)	% of Total
Stationary Sources		
Fuel Combustion	1.1	5.5%
Waste Burning	-	-
Solvent Use	-	-
Petroleum Processing, Storage and Transport	-	-
Industrial Processes	0.7	3.5%
Pesticide Application	-	-
Farming Operations	-	-
Construction and Demolition	-	-
Entrained Road Dust - Paved	-	-
Entrained Road Dust- Unpaved	-	-
Unplanned Fires	-	-
Natural Sources	-	-
Total Stationary Sources	**1.8**	**9.0%**
Mobile Sources		
On-Road Vehicles	13.0	65.3%
Off-Road Vehicles	-	-
Trains	2.0	10.1%
Aircraft	-	-
Mobile Equipment	3.1	15.6%
Utility Equipment	-	-
Total Mobile Sources	**18.1**	**91.0%**
Grand Total	**19.9**	**100.0%**

TABLE 6-12

PM-10 EMISSION INVENTORY FOR MADERA COUNTY

	Average Daily Emissions (Tons/Day)	% of Total
Stationary Sources		
Fuel Combustion	0.3	0.8%
Waste Burning	0.7	1.9%
Solvent Use	-	-
Petroleum Processing, Storage and Transport	-	-
Industrial Processes	0.8	2.2%
Pesticide Application	-	-
Farming Operations	7.3	19.7%
Construction and Demolition	1.6	4.3%
Entrained Road Dust - Paved	8.3	22.4%
Entrained Road Dust - Unpaved	11.0	29.7%
Unplanned Fires	0.4	1.1%
Natural Sources	4.6	12.4%
Total Stationary Sources	**35.0**	**94.6%**
Mobile Sources		
On-Road Vehicles	1.4	3.8%
Off-Road Vehicles	-	-
Trains	0.1	0.3%
Aircraft	-	-
Mobile Equipment	0.4	1.1%
Utility Equipment	-	-
Total Mobile Sources	**2.0**	**5.4%**
Grand Total	**37.0**	**100.0%**

REGIONAL AIR QUALITY PLANNING

Federal Air Quality Programs

The U.S. Clean Air Act Amendments of 1977 required that each state identify areas within its borders that do not meet federal primary standards as non-attainment areas. Table 6-13 shows the attainment state for federal ambient air quality standards for Madera County. Madera County is considered non-attainment under the federal Clean Air Act for ozone and PM-10, and either attainment or unclassified for other pollutants.

The federal Clean Air Act required the preparation of a non-attainment plan showing how the federal standards were to be met by 1987. Madera County was one of many non-attainment areas in California that failed to meet the federal ambient air quality standards by 1987.

The federal Clean Air Act Amendments of 1990 require that new non-attainment plans be prepared and submitted to the U. S. Environmental Protection Agency. The San Joaquin Valley Unified Air Pollution Control District has recently adopted federal nonattainment plans for PM-10 and carbon monoxide; the federal non-attainment plan for ozone is scheduled to be completed in November 1993 (San Joaquin Valley Unified Air Pollution Control District 1991, 1992a).

State Air Quality Programs

Prior to 1988 there was no timetable for attainment of the state air quality standards. The California Clean Air Act, enacted in 1988, requires local air pollution control districts to prepare air quality attainment plans for ozone and carbon monoxide. Generally, these plans must provide for district-wide emission reductions of five percent per year averaged over consecutive three-year periods. The Act also grants air districts explicit statutory authority to adopt indirect source regulations and transportation control measures, including measures to encourage or require the use of ridesharing, flexible work hours, or other measures which reduce the number or length of vehicle trips.

Table 6-13 shows the attainment status for state ambient air quality standards for Madera County. Under the California Clean Air Act, Madera County is considered non-attainment for ozone and suspended particulate (PM-10). The County is either in attainment or unclassified for other pollutants.

TABLE 6-13

ATTAINMENT STATUS FOR MADERA COUNTY

Pollutant	State Designation	Federal Designation
Ozone	Nonattainment	Nonattainment
Carbon Monoxide	Unclassified	Unclassified
Nitrogen Dioxide	Unclassified	Unclassified
Sulfur Dioxide	Unclassified	Unclassified
PM-10	Nonattainment	Nonattainment
Sulfates	Unclassified	NA
Lead	Attainment	NA
Hydrogen Sulfide	Unclassified	NA
Visibility Reducing Particles	Unclassified	NA

NA = Not Applicable

Source: California Air Resources Board, 1989

The State-required nonattainment plan for ozone and carbon monoxide for the air basin as been recently adopted (San Joaquin Valley Unified Air Pollution Control District 1992b), and has been approved by the State Air Resources Board.

The California Clean Air Act of 1988 empowers regional air quality management districts with new authority to design, adopt, implement, and enforce comprehensive plans for attaining and maintaining both the state air quality standards by the earliest practical date. Among its provisions, the California Clean Air Act provides districts with the authority to establish new controls on mobile sources of pollution.

Specific transportation performance standards are part of the California Clean Air Act requirements, including:

- substantially reduce the rate of increase in passenger vehicle trips and vehicle miles travelled;
- achieve a designated vehicle occupancy rate during the peak travel periods by 1999; and
- provide for no net increase in vehicle emissions beyond the year 1997.

The 1991 *Air Quality Attainment Plan* for the San Joaquin Valley Air Basin identifies several Transportation Control Measures (TCMs) as "reasonably available" in the San Joaquin Valley Air Basin. The following TCMs are included in the *Plan*; some of these are not currently feasible for Madera County but should be considered as long-term measures.

1. Traffic Flow Improvements
2. Public Transit
3. Passenger Rail and Support Facilities

4. Rideshare Program
5. Suburban Area Park and Ride Lots
6. Fringe Area Park and Ride Lots
7. Bicycling Program
8. Trip Reduction Programs
9. Parking Management - Supply Limits
10. Parking Management - Increased Prices
11. Telecommunications
12. Alternative Work Schedules
13. Fleet Operators Alternate Fuels Program
14. Rapid Rail and Support Facilities

The *Plan* also proposes an indirect source program consisting of three elements:

- Enhanced District CEQA Participation
- Air Quality Element for General Plans
- New and Modified Indirect Source Review

The San Joaquin Valley Unified Air Pollution Control District has published a Air Quality Element Guidelines to be considered in the preparation and amendment of local general plans.

6.8 FINDINGS

- Much of the valley area of Madera County contains prime agricultural soils; class I soils are primarily centered around the cities of Madera and Chowchilla and the area near the Rolling Hills subdivision. Class II soils occur in the extreme western portion of the county along the San Joaquin River.

- According to the California Department of Conservation's Important Farmland categories, the majority of the land west of the Madera Canal is classified as either, Unique Farmland, Prime Farmland, and Farmland of Statewide Importance. The land east of the Madera Canal, to Oakhurst and North Fork areas consists mainly of Grazing Land.

- Agricultural production constitutes a major portion of Madera County's economy; in 1990, over 790,000 acres were devoted to agricultural uses, and the total crop value in 1992 was $607,543,000.

- Most of the land in the county devoted to agricultural uses is under Williamson Act contract; however, the number of contracts has been steadily declining (due to nonrenewal of contracts) in recent years, due to the pressures of urbanization.

- Almost all of the timberland in Madera County lies within the boundaries of the Sierra National Forest.

- Recent federal cutbacks in the annual allowable sale quantity (ASQ) of timber will result in an approximately 30 percent reduction of harvest levels in the Sierra National Forest. This is likely to result in the closure of the mill at North Fork.

- Significant mineral resource extraction operations in Madera County include aggregate, stone (subbase), and dimension stone (granite).

- The most significant mineral resource in the county, in terms of abundance, demand, and economic value, is aggregate, contained in deposits along the San Joaquin River.

- Water supply in the county is highly dependent upon rain and snow precipitation, and is thus subject to frequent fluctuations.

- Surface water is relied upon to meet approximately half of the agricultural demand for water.

- Groundwater is used to supply almost all municipal and community demand, and approximately half of agricultural demand (this percentage increases in dry years), and supplies are rapidly being depleted (mainly due to agricultural use). Recent legislation allowing the sale of agricultural surface supplies to sources outside the county could exacerbate the decline of groundwater aquifers in the county.

- Surface and groundwater quality in the county is generally good.

- The varied physical topography and diversity of climates in Madera County has favored a diversity of biotic habitats, and plant and animal species occurring within them.

- The native biotic habitats of the San Joaquin Valley have been substantially modified by agriculture, urban development, and the diversion of water from natural drainages, particularly the large rivers in the county. However, western Madera County continues to provide important habitat for resident and migratory wildlife species.

- Native foothill habitats in the county have been modified by grazing and low-density residential development, but with the possible exception of riparian habitats, their structure and floristic elements remain much the same as a half century ago. Foothill habitat serves as an important connecting link between the San Joaquin Valley and the Sierras.

- Habitats of the Sierra Nevada area are the least altered of all the biotic habitats in Madera County. Yet, the fragmentation of movement corridors in the San Joaquin Valley and Sierra foothills, the loss of foothill wintering habitat from residential development, the damming of rivers and streams and, potentially, the high levels of air pollution, all have adverse effects on the fish and wildlife resources of the Sierra Nevada.

- The San Joaquin kit fox, blunt-nosed leopard lizard, Bald Eagle, and Hartweg's Pseudobahia are federally threatened and endangered species that occur in Madera County. The Fresno kangaroo rat and Ferris' Bird's-beak are such species that potentially occur in the county. In addition, there are numerous special status species which may potentially occur in county.

- Riparian, northern hardpan vernal pools, alkaline desert scrub, fresh emergent wetlands, wet meadows, and oak woodlands are sensitive biotic habitats in Madera County.

- The Oakhurst deer herd, which winters in the Bass Lake/Oakhurst area, is a sensitive biotic resource in the county.

- Areas of Madera County designated as "Significant Natural Areas" by the Department of Fish and Game include Little Table Mountain West and Southwest, Indian Lake Estates, Pine Grove Mine, Ahwahnee, Firebaugh Sacaton Grassland, Buena Vista Peak, and Stairway Creek.

- Past efforts by federal, state, and local governments have resulted in steady, gradual improvement in air quality in the San Joaquin Valley Air Basin. Despite considerable improvement in air quality over a period of 20 years, however, air quality in Madera County and the greater San Joaquin Valley Air Basin still does not meet all ambient air quality standards, and the latest projections do not show attainment of all ambient air quality standards any time soon.

- Potential future growth in population and employment could have a substantial effect on future air quality. Indirect source controls (site planning, land use or transportation strategies to reduce trip generation) will become increasingly important in the future.

- The San Joaquin Valley Unified Air Pollution Control District recommends the inclusion or air quality elements or the equivalent in local general plans, and has published Air Quality Element Guidelines to assist in this effort.

6.9 PERSONS CONSULTED

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6.11 GLOSSARY

Air Pollution - Concentrations of substance found in the atmosphere that exceed naturally occurring quantities and are undesirable or harmful in some way.

Agricultural Preserve - Land designated for agriculture or conservation (see "Williamson Act").

Agriculture - Use of land for the production of food and fiber, including the growing of crops and/or the grazing of animals on natural, prime, or improved pasture land.

Aquifer - An underground, water-bearing layer of earth, porous rock, sand or gravel, through which water can seep or be held in natural storage. Aquifers generally hold sufficient water to be used as a water supply.

Carbon Dioxide - A colorless, odorless, highly poisonous gas produced by automobile and other machines with internal combustion engines that imperfectly burn fossil fuels such as oil and gas.

Endangered Species - A species of animal or plant is considered to be endangered when its prospects for survival and reproduction are in immediate jeopardy from one or more causes.

Estivate - period of hibernation during the heat of summer.

Groundwater - Water under the earth's surface, often confined to aquifers capable of supplying wells and springs.

Groundwater Recharge - The process of infiltration and percolation of rainwater from land areas or streams through permeable soils into water-holding rocks that provide underground storage ("aquifers").

Habitat - The physical location or type of environment in which an organism or biological population lives or occurs.

Impervious Surface - Surface through which water cannot penetrate, such as roof, road, sidewalk, and paved parking lot; the amount of impervious surface increases with development and establishes the need for drainage facilities to carry the increased runoff.

Intermittent Stream - A stream that normally flows for at least 30 days after the last major rain of the season and is dry a large part of the year.

Mineral Resource - Land on which known deposits of commercially viable mineral or aggregate deposits exist; this designation is applied to sites determined by the California Division of Mines and Geology to be resources of regional significance, and is intended to help maintain the quarrying operations and protect them from encroachment of incompatible land uses.

Mining - The act or process of extracting resources, such as coal, oil, or minerals, from the earth.

National Ambient Air Quality Standards - The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

Nitrogen Oxide(s) - A reddish brown gas that is a byproduct of combustion and ozone formation processes. Often referred to as NOx, this gas gives smog its "dirty air" appearance.

NGVD - National Geodetic Vertical Datum

Ozone - A tri-atomic form of oxygen (O_2) created naturally in the upper atmosphere by a photochemical reaction with solar ultraviolet radiation. In the lower atmosphere, ozone is a recognized air pollutant that is not emitted directly into the environment, but is formed by complex chemical reactions between oxides of nitrogen and reactive organic compounds in the presence of sunlight, and becomes a major agent in the formation of smog.

Pollutant - Any introduced gas, liquid, or solid whose nature, location, or quantity produces undesired environmental effects.

Rare or Endangered Species - A species of animal or plant listed in: Sections 670.2 or 670.5, Title 14, *California Administrative Code*, or Title 50, *Code of Federal Regulations*, Section 17.11 or Section 17.2, pursuant to the *Federal Endangered Species Act* designating species as rare, threatened, or endangered.

Reclamation - The reuse of resources, usually those present in solid wastes or sewage.

Riparian - The type of environment generally present along watercourses.

SCS - U.S. Soil Conservation Service.

SJVUAPCD - San Joaquin Valley Unified Air Pollution Control District

SNF - Sierra National Forest

Special Status Species - Officially designated (rare, threatened, or endangered) and candidate species listed by the California Department of Fish and Game; officially designated (threatened or endangered) and candidate species for listing by the U.S. Fish and Wildlife Service; taxa considered to be rare or endangered under the conditions of Section 15380 of the *State CEQA Guidelines*, such as those identified on lists 1A, 1B, and 2 in the *Inventory of Rare and Endangered Vascular Plants of California,* and other taxa which are considered sensitive or of special concern due to limited distribution or lack of adequate information to permit listing or rejection for state or federal status, such as those included on list 3 and 4 in the *California Native Plant Society In*ventory or identified as "Species of Special Concern" by the California Department of Fish and Game.

TPZ - Timberland Production Zone

Watershed - The total area above a given point on a watercourse that contributes water to its flow; the entire region drained by a waterway or watercourse that drains into a lake or reservoir.

Wetlands - Transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Under a "unified" methodology now used by all federal agencies, wetlands are defined as "those areas meeting certain criteria for hydrology, vegetation, and soils."

Williamson Act - Known formally as the *California Land Conservation Act of 1965*, it was designed to be an incentive to retain prime agricultural land and open space in agricultural use, thereby slowing its conversion to urban and suburban development; the program entails a 10-year contract between the City or County and an owner of land whereby the land is taxed on the basis of its agricultural use rather than the market value; the land becomes subject to certain enforceable restrictions, and certain conditions must be met before approval of an agreement.

CHAPTER 7

SAFETY

CHAPTER 7

SAFETY

7.1 INTRODUCTION

In planning for development, there are a wide range of environmental hazards to be considered. Some of these hazards are man-made, and some are due to natural environmental factors. Much of the risk associated with environmental hazards can often be greatly reduced, or even eliminated, through locational decisions. Where development must occur in a potentially hazardous area, the use of mitigation measures can reduce risks to life and property. This chapter inventories and assesses the various environmental hazards in Madera County, including seismic and geologic, flood, fire, aircraft crash, and hazardous waste hazards.

7.2 SEISMIC AND GEOLOGIC HAZARDS

Government Code Section 65302 discusses the significant issues that a General Plan must address in its Safety Element. Among those issues are the potential for seismically-induced surface rupture, ground shaking, ground failure, tsunami, seiche, slope instability, and subsidence. Seismic and geologic hazards must be considered in determining design and building standards, and the location of future development, in order to minimize or mitigate the risk of injury, death, and property damage which could result from natural and man-made hazards.

Madera County is divided into two major physiographic and geologic provinces: the Sierra Nevada Range and the Central Valley. The Sierra Nevada physiographic province in the northeastern portion of the county is underlain by metamorphic and igneous rock. It consists mainly of homogenous types of granitic rocks, with several islands of older metamorphic rock. The central and western parts of the county are part of the Central Valley province, underlain by marine and non-marine sedimentary rocks. It is basically a flat, alluvial plain, with soil consisting of material shed by the uplifting of the mountains, as well as San Joaquin River alluvium in the western valley. Consolidated alluvium occurs at depths of 500 feet near the city of Madera, to approximately 20,000 feet in the western county.

The foothill area of the county is essentially a transition zone, containing old alluvial soils that have been dissected by the west-flowing rivers and streams which carry runoff from the Sierra Nevadas. This gently rolling topography is broken in many areas by outcroppings of bedrock. Soils here are generally quite dense and compact.

SEISMICITY

Seismicity varies greatly between the two major geologic provinces represented in Madera County. The Central Valley is an area of relatively low tectonic activity bordered by mountain ranges on either side. The Sierra Nevadas, partly within Madera County, are the result of movement of tectonic plates which resulted in the creation of the mountain range. The Coast Ranges on the west side of the Central Valley are also a result of these forces, and continued movement of Pacific and North American tectonic plates continues to elevate the ranges. Most of the seismic hazards in Madera County result from movement along faults associated with the creation these ranges.

Earthquakes are typically measured in terms of magnitude and intensity. The most commonly known measurement is the Richter Scale, a logarithmic scale which measures the strength of a quake. The Mercalli Scale is used to measure the intensity of a quake at a given location. The Modified Mercalli Scale is a function of the following factors:

- The magnitude and location of the epicenter of the quake;
- The geologic characteristics of an area;
- The groundwater characteristics of an area;
- The duration and character of the ground motion;
- The structural characteristics of a building.

Table 7-1 describes the effects of the 12 levels of the Mercalli Scale.

TABLE 7-1

MODIFIED MERCALLI SCALE OF EARTHQUAKE INTENSITY

Scale	Effects
I.	Earthquake shaking not felt.
II.	Shaking felt by those at rest
III.	Felt by most people indoors; some can estimate duration of shaking.
IV.	Felt by most people indoors. Hanging objects swing, windows and doors rattle, wooden walls and frames creak.
V.	Felt by everyone indoors; many estimate duration of shaking. Standing autos rock. Crockery clashes, dishes rattle, and glasses clink. Doors close, open, or swing.
VI.	Felt by everyone indoors and most people outdoors. Many now estimate not only the duration of the shaking, but also its direction and have no doubt as to its cause. Sleepers awaken. Liquids disturbed, some spilled. Small unstable objects displaced. Weak plaster and weak materials crack.
VII.	Many are frightened and run outdoors. People walk unsteadily. Pictures thrown off walls, books off shelves. Dishes or glasses broken. Weak chimneys break at roofline. Plaster, loose bricks, unbraced parapets fall. Concrete irrigation ditches damaged.
VIII.	Difficult to stand. Shaking noticed by auto drivers. waves on ponds. Small slides and cave-ins along sand or gravel banks. Stucco and some masonry walls fall. Chimneys, factory stacks, towers, elevated tanks twist or fall.
IX.	General fright. People thrown to the ground. Steering of autos affected. Branches broken from trees. General damage to foundations and frame structures. Reservoirs seriously damaged. Underground pipes broken.
X.	General panic. Conspicuous cracks in ground. Most masonry and frame structures destroyed along with their foundations. Some well-built wooden structures and bridges are destroyed. Serious damage to dams, dikes, and embankments. Railroads bent slightly.
XI.	General panic. Large landslides. Water thrown out of banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flatland. General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.
XII.	General panic. Damage nearly total, the ultimate catastrophe. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

Source: California Division of Mines and Geology, 1973

FAULTS

Faults are an indications of past seismic activity. It is assumed that those which have been active most recently are the most likely to be active in the future. The recency of seismic activity is measured in geologic terms. Geologically recent is within the last two million years (the Quaternary period). All faults believed to have been active during Quaternary time are considered "potentially active." Those which have exhibited activity within the last 10,000 years are considered "active." According to the State Division of Mines and Geology (DMG), there are no active or potentially active faults of major historic significance within Madera County; as a result, the county does not lie within any Alquist-Priolo Special Studies Zone for surface faulting or fault creep. However, there are two significant faults within the larger region that have been, and will continue to be, the principal sources of potential seismic activity within Madera County.

San Andreas Fault

The San Andreas Fault lies to the west of Madera County, approximately 45 miles from the county line. This fault has a long history of activity, and is thus the primary concern in determining seismic activity within the county. Activity along the fault varies along its span from the Gulf of California to Cape Mendocino. The western tip of Madera County lies within the "Central California Active Area," where large numbers of earthquakes have originated.

Owens Valley Fault Group

The Owens Valley Fault Group is a complex system containing both active and potentially active faults, on the eastern base of the Sierra Nevada Range. The group is located approximately 80 miles east of the Madera County line, in Inyo County. This system has historically been the source of seismic activity within Madera County.

Other Active and Potentially Active Faults

The *Draft Environmental Impact Report* for the new state prison project near Fairmead identified faults within a 100-mile radius of the project site. Since Fairmead is centrally located along Highway 99 within the county, this information provides a good indicator of the potential seismic activity which might be felt within Madera County. Fifteen active faults (including the San Andreas and Owens Valley systems) were identified in the *Preliminary Geotechnical Investigation*. Four of the faults lie along the eastern portion of the Sierra Nevada Range, approximately 75 miles to the northeast of Fairmead. These are the Parker Lake, Hartley Springs, Hilton Creek, and Mono Valley Faults. The remaining faults are in the western portion of the San Joaquin Valley, as well as within the Coast Range, approximately 47 miles west of Fairmead. Most of the remaining 11 faults are "associated with the San Andreas, Calaveras, Hayward, and Rinconada Fault Systems that collectively form the tectonic plate boundary" of the Central Valley (*Draft EIR, California State Prison II, Madera County,* Appendix D-II, 1991).

In addition, the Clovis fault, although there is no historic evidence of its activity, is considered to be active within quaternary time (within the past two million years), and is thus classified as "potentially active." This fault lies approximately six miles south of the Madera County line, in Fresno County. Activity along this fault could potentially generate more seismic activity in Madera County than the San Andreas or Owens Valley fault systems. In particular, a strong earthquake on the Clovis fault could affect southern Madera County. However, because of the lack of historic activity along the Clovis fault, there is inadequate evidence for assessing maximum earthquake impacts.

MAXIMUM EARTHQUAKES

Table 7-2 lists the faults within 100 miles of Fairmead (centrally located within the county), the length of the fault, its slip rate, intervals of earthquake activity, and the maximum credible and maximum probable earthquake which might occur. "Maximum probable magnitude" is the most likely magnitude earthquake to occur along a particular fault within the next 100 years. The table lists the magnitude of the earthquake and the intensity as would be felt in Fairmead. It should be noted that the intensity in Madera County would vary depending on the location in the county, and could be higher or lower than in Fairmead, depending on the distance from the fault and local geologic conditions.

The Federal Emergency Management Agency (FEMA) prepared a report in 1991 (Building Seismic Safety Council, *NEHRP Recommended Provisions for the Development of Seismic Regulations for New Buildings*; FEMA Report 222) prepared seismic zonation maps for Madera County. These maps utilize probabilistic seismic hazard mapping techniques and consider the effects of earthquakes east of the county (along the San Andreas fault), and earthquakes east of the county (in the Mammoth - Long Valley Caldera area). The maps indicated that populated areas (San Joaquin Valley area) of Madera County could be subject to seismic shaking of :

- a maximum 0.3 second spectral response acceleration of $\approx 0.4g$, with a 90 percent probability of non-exceedence in 250 years

- a maximum 1.0 second spectral response acceleration of $\approx 0.15g$ to $20g$, with a 90 percent probability of non-exceedence in 250 years.

These seismic zonation maps are shown in Appendix E of this *Background Report*. In addition, Appendix E includes a comprehensive reference list recommended by the California Department of Mines and Geology.

TABLE 7-2

MAXIMUM PROBABLE EARTHQUAKE EVENT
In Fairmead Area

Fault or Fault System	Distance and Direction from Fairmead area (miles)	Fault Length (miles)	Slip Rate (mm/year)	Recurrence Interval (years)	Maximum Credible Magnitude and Intensity		Maximum Probable Magnitude and Intensity	
					(M)	(MM)	(M)	(MM)
Calaveras	71, NW	19	7.0	150	7.00	V	6.50	V
Greenville	73, NW	17	0.7	3,585	7.00	V	5.25	IV
Hartley Springs	75, NE	10	0.2	8,424	6.75	V	4.75	III
Hayward	81, NW	31	4.0	556	7.00	V	6.75	IV
Hilton Creek Region	81, NE	10	2.0	554	7.00	V	6.50	IV
Los Positas	91, NW	8	1.6	872	6.50	IV	4.50	III
Mono Valley	81, NE	18	7.5	557	7.00	V	6.50	IV
Ortigalita	47, SW	13	0.04	10,000	6.75	VI	4.50	IV
Parker Lake	72, NE	21	0.5	3,083	6.75	V	5.75	III
Rinconada	84, SW	75	2.4	140	7.00	V	6.00	IV
San Andreas (Creep)	67, SW	22	34	140	7.00	VI	6.00	IV
San Andreas (Mojave)	95, SW	202	34	345	8.50	VI	8.25	V
San Andreas (North)	84, W	52	34	228	8.00	VI	7.50	V
San Juan	98, SW	40	NA	NA	7.25	IV	6.25	III
Sargent	76, W	24	1.0	NA	7.00	V	5.75	IV

M = magnitude, as measured by the Richter scale
MM = intensity, as measured by the Modified Mercalli scale (see Table 7-1)
NA = not available

Source: *Draft Environmental Impact Report for the California State Prison Madera County II* (Appendix D-II), prepared for State of California Department of Corrections, prepared by Michael Brandman Associates, March 1991.

GROUNDSHAKING

Groundshaking is the primary seismic hazard in Madera County, because of the county's seismic setting and its record of historical activity. Thus, emphasis was given to the analysis of expected levels of groundshaking, which is directly related to the magnitude of a quake and the distance from a quake's epicenter. Magnitude is a measure of the amount of energy released in an earthquake, with greater magnitudes causing greater amounts of groundshaking for longer periods of time and in a large area. Groundshaking intensity, which is often a more useful measure of earthquake effects than magnitude, is a qualitative measure of the effects felt by people.

The valley portion of Madera County is located on alluvium deposits, which tend to experience greater groundshaking intensities than areas located on hard rock. Therefore, structures located in the valley will tend to suffer greater damage from groundshaking than those located in the foothill and mountain areas. However, there are alluvium valleys and weathered or decomposed zones scattered throughout the mountainous portion of the county which could also experience stronger intensities than the surrounding solid rock areas. The geological characteristics of an area can thus be a greater hazard than its distance to the epicenter of the quake.

The *Five County Seismic Safety Element* was prepared in 1974 by the Tulare County Council of Governments for the counties of Fresno, Kings, Tulare, Madera, and Mariposa as technical background on seismic safety for the region. The study divides the region into various microzones, which are based on an engineering model that utilizes data on subsurface geology, distance to faults, and historical earthquakes. The area west of the Madera Canal is located in Zone VI. Assuming the maximum probable earthquake of magnitude 8 - 8.5 on the San Andreas fault, "relatively low levels of shaking should be expected in the eastern and central parts of the valley." The eastern portion of the county is composed of four "Sierran Zones," the boundaries of which are determined by the predicted effects of the maximum probable earthquake on the Owens Valley fault. Since the mountains are underlain primarily by granitic rock, these zones tend to experience very low levels of near-surface amplification, or groundshaking. However, most of the people living in these zones do not live on the hard rock; instead, they tend to live in alluvial valleys, or the weathered and decomposed zones in the meadows or foothills. These areas will experience stronger groundshaking intensities. Characteristics within the microzones vary greatly; thus groundshaking potential in the Sierran zones is better analyzed on a site by site basis.

Older buildings constructed before building codes were in effect, and even newer buildings constructed before earthquake resistance provisions were included in the current building codes, are the most likely to suffer damage in an earthquake. Most of Madera County's buildings are one or two stories high and are of wood frame construction, which is considered the most structurally resistant to earthquake damage.

Older masonry buildings without earthquake-resistant reinforcement are the most susceptible to the sort of structural failure which causes the greatest loss of lives. The susceptibility of a structure to damage from earthquake groundshaking is also related to the foundation material underlying the structure. A foundation of rock or very firm material intensifies short period motions, which affect the low, rigid buildings more than tall, flexible ones. A deep layer of water-logged soft alluvium may cushion low, rigid buildings, but accentuate the motion in tall buildings. The amplified motion resulting from softer alluvium soils can also severely damage older masonry buildings.

Other potentially dangerous conditions include building projections which are not firmly anchored, such as parapets and cornices. These projections could collapse during periods of strong and/or sustained groundshaking.

Fire is often a major form of damage resulting from groundshaking effects. Ninety percent of the destruction in the 1906 San Francisco earthquake was caused by fire. This devastation resulted largely from the great number of buildings constructed of combustible materials, damage to much of the city's fire fighting facilities, and the rupture of water mains.

LIQUEFACTION

Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. Areas most prone to liquefaction are those which are water-saturated (specifically where the water table is less than 30 feet below the surface), and consist of relatively uniform sands that are of loose to medium density. Of particular concern in terms of developed and developing areas are fill areas that have been poorly consolidated. Although there are areas of Madera County where the water table is at 30 feet or less below the surface, soil types in the area are not conducive to liquefaction because they are either too coarse in texture or too high in clay content. In other words, the soil types mitigate against the potential for liquefaction.

LANDSLIDES

Areas of fracturing and steep slopes with inadequate ground cover in the foothill and mountain areas are prone to landsliding. There are many such areas in the metamorphic rocks of the Sierras. There is no risk of large landslides in the valley area of the county, since it is essentially flat and topographically featureless. There is, however, potential for small slides and slumping along the steep banks of rivers and creeks.

The *Five County Seismic Safety Element* identified four "risk categories." Areas of "no risk" are mainly flatlands, valley bottoms, and "areas of minimal topographic relief." "Low risk" areas consist of "hillside and mountainous terrain of competent igneous and metamorphic rocks and sedimentary rocks with favorable bedding and composition." This is a relatively stable category that includes much of the Sierras. The "moderate risk" zone "includes dip slopes (natural slopes parallel to bedding in sedimentary rocks), complexly folded metamorphic rocks, and zones of fractured rock." The "high risk" zone includes several areas of the Sierras which consist of weak, landslide-prone rock and existing landslides. Figure 7-1 shows these areas in Madera County. In summary, landslide hazards within the county are confined to the foothills and mountainous terrain, and the steep banks of the rivers which pass through the valley floor.

SEICHE

A seiche is a seismically-induced wave in a reservoir, lake, or harbor. Seiches have the potential to damage shoreline structures, dams, and levees. Seiches are not a great concern in Madera County, because the largest recorded seismically-induced wave heights were 1.2 feet according to the *Five County Seismic Safety Element*; this is lower than those that have been induced by wind. In addition, the effects from a seiche would be similar to the flood hazard for a particular area, and the risk of occurrence is perceived as being considerably less than the risk of flooding.

SUBSIDENCE

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of ground water, or oil and gas. Soils that are particularly subject to such compression include those with high silt or clay content. Subsidence caused by ground water withdrawal presents a more serious problem, since it generally affects large areas. Oil and gas withdrawal, on the other hand, tends to affect smaller, localized areas. Some areas of the San Joaquin Valley have experienced substantial amounts of subsidence, in excess

of 20 feet over the past 50 years. However, the valley areas of Madera County have not experienced this problem. The nearest subsidence problems lie to the west of Madera County, in Fresno County. Because there is no high water table in Madera County, the risk of subsidence is considered to be very low.

VOLCANIC HAZARDS

The nearest volcanoes lie in Mono County, in the Mammoth Lakes/Long Valley area, to the northeast of Madera County. The most serious effect on Madera County of an eruption in the Mammoth Lakes area, according to the DMG, would be ash deposition. Such an occurrence is highly unlikely, for two reasons. First, ash deposition in the county would be dependent upon an improbable northeast wind configuration. Second, and most importantly, although some of these volcanoes were active as recently as 800 years ago, they are generally not considered by geologists to be active. In the past decade, however, there has been renewed interest in the area by geologists, as a result of new patterns of earthquakes and uplifting of the earth's crust; it was hypothesized by some that the area may be entering a new period of activity. A volcanic eruption during the winter could result in snow melt and lead to flooding.

The State has formulated a contingency plan, Plan Caldera, designed to protect the public in the event of an earthquake in the Long Valley area. Madera County's *Multi-Hazard Functional Plan* incorporates the provisions of the Caldera Plan.

7.3 FLOOD HAZARDS

There are four major rivers in Madera County: the Chowchilla River, which forms a portion of the northwestern boundary of the county; the Fresno River, which flows through the central portion of the county; the San Joaquin River, which forms most of the southern boundary of the county; and the Merced River, which is in the northeast portion of the county, above 5,000 feet. In addition, there are several creeks in the foothills and mountainous areas of the county.

Both the valley and mountain areas have experienced flooding, most recently in the winter of 1992. Flooding in Madera County can occur as a result of heavy rains, dam failure, excessive snowmelt and runoff, levee failure, and localized drainage problems. Principal flood problems, as identified in a *Flood Insurance Study* completed by the Federal Emergency Management Agency (FEMA) in 1987, lie along Cottonwood, Root, Dry, and Schmidt Creeks, and the Schmidt Creek Tributary. All have perennial flow, and all of the channels are poorly defined and subject to flooding. The construction of Buchanan, Hidden, and Friant Dams, as well as levee improvements along the sloughs and rivers, have eliminated major flooding problems along the San Joaquin, Fresno, and Chowchilla Rivers.

In the mountain area of the county, the primary flood problem, in terms of its potential to affect a developed area, is the North Fork of Willow Creek. The creek runs through the middle of the community of North Fork and floods in wet years. If the dam at Bass Lake were to fail, this situation would be exacerbated.

100-YEAR FLOOD PLAIN

FEMA has identified the 100-year floodplain, or the area that has a one percent chance of being flooded in any given year. Much of the low lying area east of Highway 99 lies within a flood-prone area. In addition, there are some existing residential subdivisions east of Highway 99 along Avenues 12 and 15 which are partially subject to a 100-year flood. Other areas are limited mainly to land adjacent to river and stream beds. Figure 7-2 shows the 100-year floodplain in Madera County.

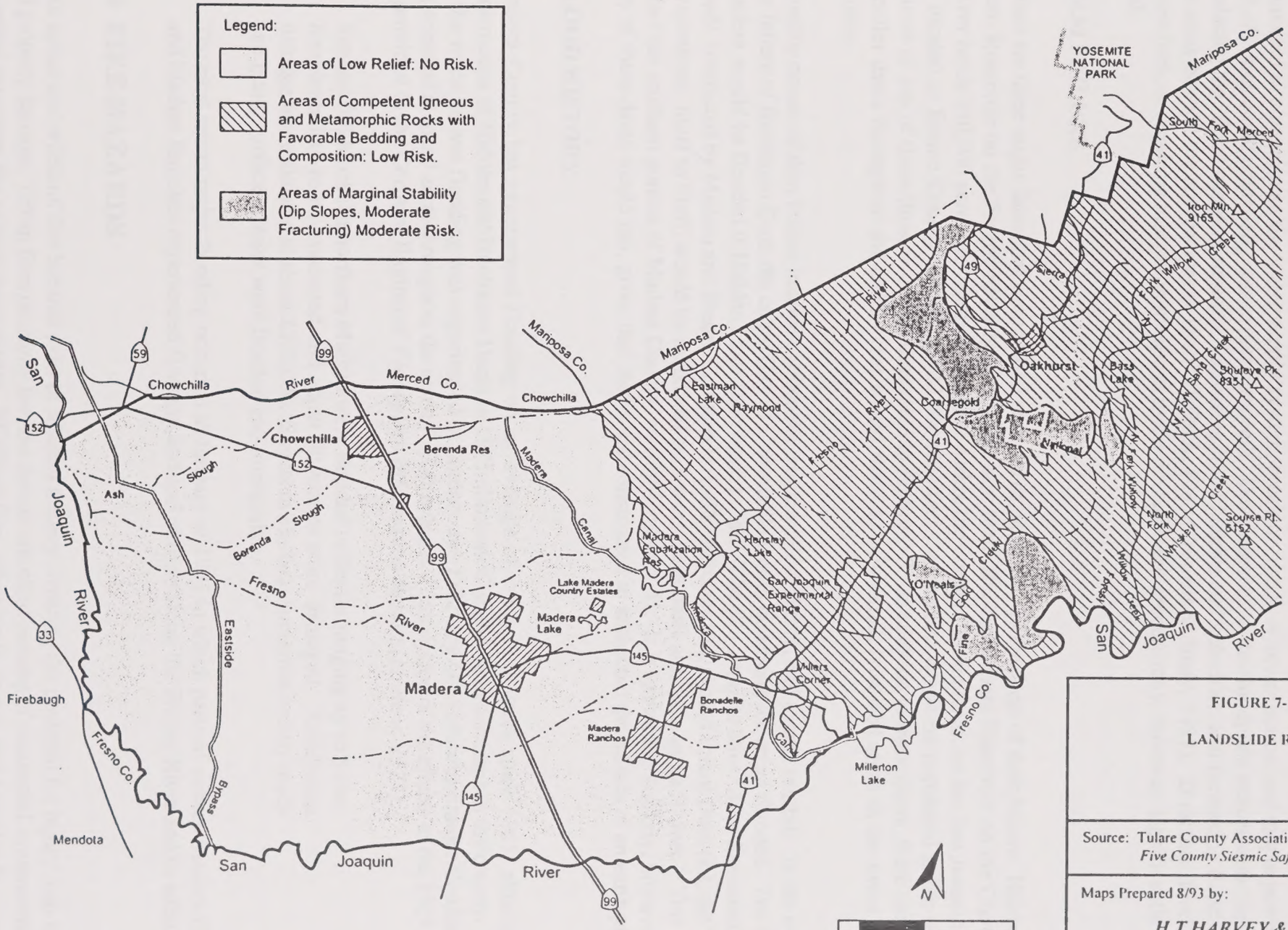

FIGURE 7-1

LANDSLIDE RISK

Source: Tulare County Association of Governments, *Five County Siesmic Safety Element*, 1974

Maps Prepared 8/93 by:

H.T. HARVEY & ASSOCIATES

These areas are subject to hazards such as drowning, or injury caused by damaged structures and infrastructure and rapidly moving objects caught in the floodflow. In addition, flood waters have the potential to contaminate the water supply system, break or overflow sewer mains, and topple power lines, all of which could potentially cause injury or death. Development in the floodplain exacerbates these risks, reducing the "flood-carrying capacity, increasing flood heights and velocities, and increasing flood hazards in areas beyond the encroachment itself" (FEMA, *Flood Insurance Study*, 1987). Directing development elsewhere, or requiring mitigation measures in the development process may, however, significantly reduce risk.

DAM FAILURE

There are three major dams that would flood portions of the county in the event of their failure. Hidden Lake Dam Reservoir on the Fresno River holds 90,000 acre feet. Buchanan Dam Reservoir on the Chowchilla River holds 150,000 acre feet. Both are located within the county. Friant Dam, on the San Joaquin River, is located in Fresno County and holds 520,000 acre feet. Areas that would be inundated in the event of failure of any of these three dams are illustrated in Figure 7-3. In addition to these dams, there are several smaller dams throughout the county that would flood mainly small, localized areas in the event of their failure.

Possible causes of dam failure include earthquake, structural instability, and excess rainfall. In the event of the failure of Buchanan Dam, the entire City of Chowchilla would be among the areas flooded. The City of Madera would be flooded if Hidden Lake Dam were to fail. The *San Joaquin River Area Reconnaissance Study*, conducted by Madera and Fresno Counties in 1986, indicates that should Friant Dam fail, the "entire riverbottom, bluff to bluff, would be inundated on a worst case basis at depths up to 50 feet." This would affect the southern portion of Madera County, west of Highway 41. It is extremely unlikely, however, that any of these dams would fail, given that they were constructed to withstand the effects of an earthquake.

FLOOD HISTORY

Madera County has experienced flooding on an average of every nine years since 1861, although the construction of Hidden and Buchanan Dams in 1975 eliminated major flood concerns in the county. Some of the worst known flooding was experienced in January and February of 1969, when major flooding was experienced in many areas throughout the county. Following is a description of the effects of the 1969 event, as provided in the Corps of Engineers' *Floodplain Information Report (Madera, 1973)*:

> Several full blocks in northern Madera were flooded in depths ranging up to 5 feet. Residents had to be evacuated and about 80 homes were damaged. Residential damage was estimated at about $535,000. Streets in Madera, numerous county roads and major surface arteries were flooded and impassable.
>
> The most recent major flooding occurred in January of 1993 in which parts of eastern Madera County and Madera Ranchos experienced flooding and soil erosion along the Fresno River and its tributaries.

7.4 FIRE HAZARDS

Both urban and wildland fire hazards exist in Madera County, creating the potential for injury, loss of life, and property damage. Urban fires primarily involve the uncontrolled burning of residential, commercial, and industrial structures due to man-made causes. Wildland fires affect grass, forest, and brushlands, as well as

any structures on these lands, and may result from either man-made and natural factors. The type and amount of fuels, topography, and climate are the primary factors influencing the degree of fire risk.

Public protection classifications are designated by the Insurance Services Office (ISO). The ISO bases its classifications on a number of factors, including fire department location, equipment, and staffing; water supply; and communications abilities. Ratings range from 1 to 10, with 1 being the best possible fire protection, and 10 being the worst. The City of Madera maintains a rating of 4, and some small areas of the unincorporated county maintain a 6. The Coarsegold, Oakhurst, Ahwahnee, Bass Lake, and North Fork areas are classified with ratings of 8. The remainder of the county currently has a rating of 9. Areas can be rerated, since new development must meet county fire protection standards. Figure 7-4 depicts the ISO ratings in the county.

STRUCTURAL FIRE HAZARDS

Factors which exacerbate structural fires include substandard building construction, highly flammable materials, delay in response time, and inadequate fire protection services.

The County Fire Department currently reviews development plans and building permits for compliance with the Uniform Fire Code. Until recent years, however, there was little or no enforcement of structural fire codes (for example, building codes requiring interior sprinkler systems and fire-safe building materials). As a result, many of the structures in Madera County which were built prior to 1987 may be substandard in terms of fire safety. There is currently no program for retrofitting of such structures (with the exception of those structures that legally require inspection, such as institutional buildings).

WILDLAND FIRE HAZARDS

Wildland fire hazards exist in varying degrees over approximately two-thirds of Madera County, to the north and east of the Madera Canal. The wildland fire season lasts approximately five to six months, from late spring to fall. Vegetation in the foothills and mountain areas is generally more dense and fire-prone than that in urban areas. Increasing development in the foothills and subsequent fire control measures have the effect of altering the natural cycle of the ecosystem, whereby periodic fires clear the understory brush. Suppression of natural fires allows the understory to become dense, and creates the potential for larger and more intense wildland fires.

The greatest wildland fire hazards exist in areas with quickly ignitable, dense understory vegetation, such as grasses, adjacent to slower and hotter burning fuels, such as trees. Particularly fire-prone vegetation can be found in the upper foothills, or chaparral belt, which is summer dormant and highly flammable. Areas of the county with steep-sloping topography are also very hazardous, since fires burn hotter and faster in these areas, response time increases, and accessibility for emergency equipment is reduced. Figure 7-5 depicts areas of the county with slopes in excess of 30 percent.

The potential for large and damaging fires increases as residential and recreational developments encroach further into the wildlands. Many steps can be taken to reduce this potential loss of life and property by wildfire: enforcement of building codes; use of green belting; removal of vegetation around structures; prescribed burning to control and reduce fuel load; implementation of fire safe practices, including proper road construction and adequate water systems; and perhaps most important, proper land use planning and zoning.

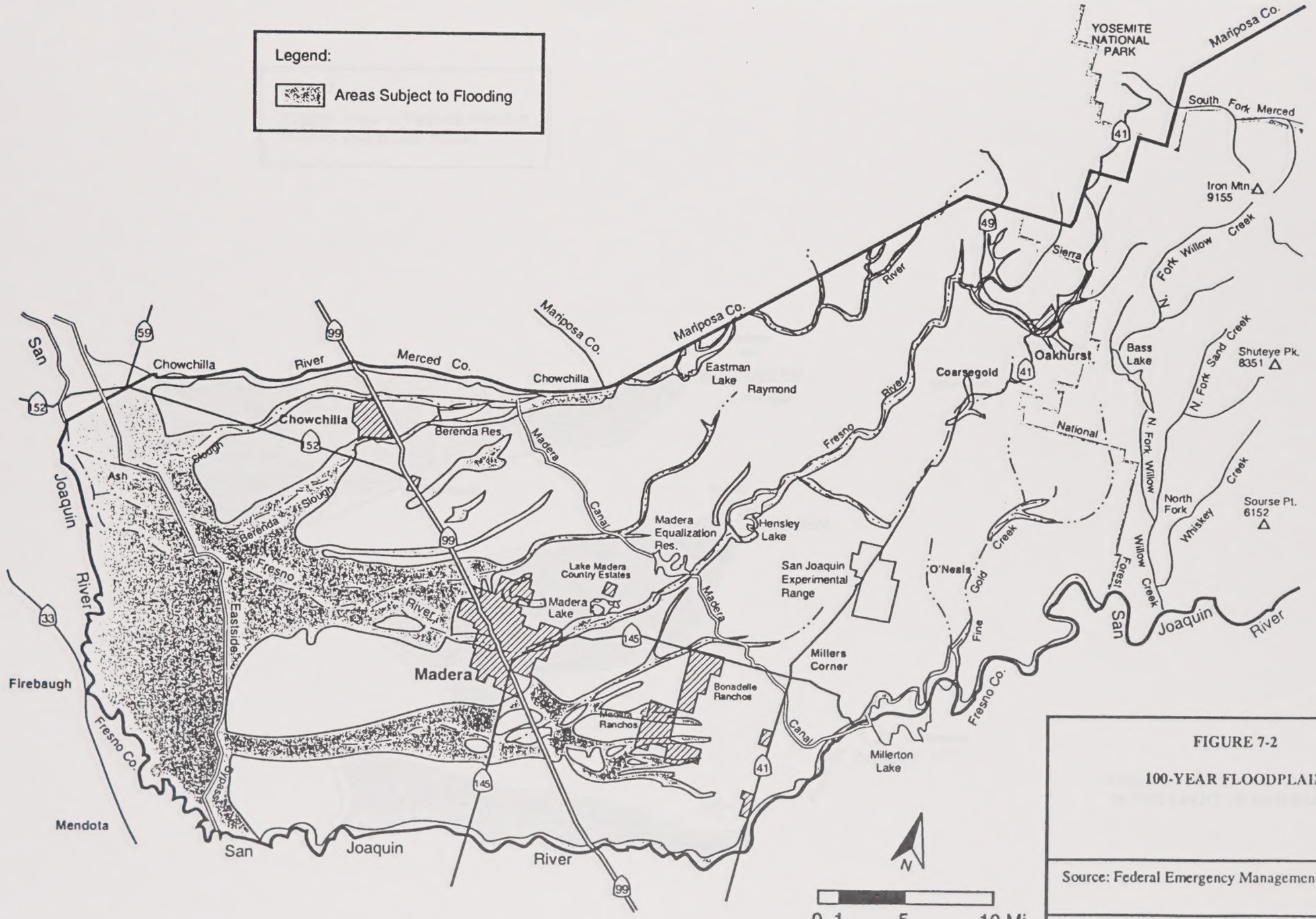

FIGURE 7-2

100-YEAR FLOODPLAIN

Source: Federal Emergency Management Agency, 1989

Maps Prepared 8/93 by: H. T. Harvey & Associates

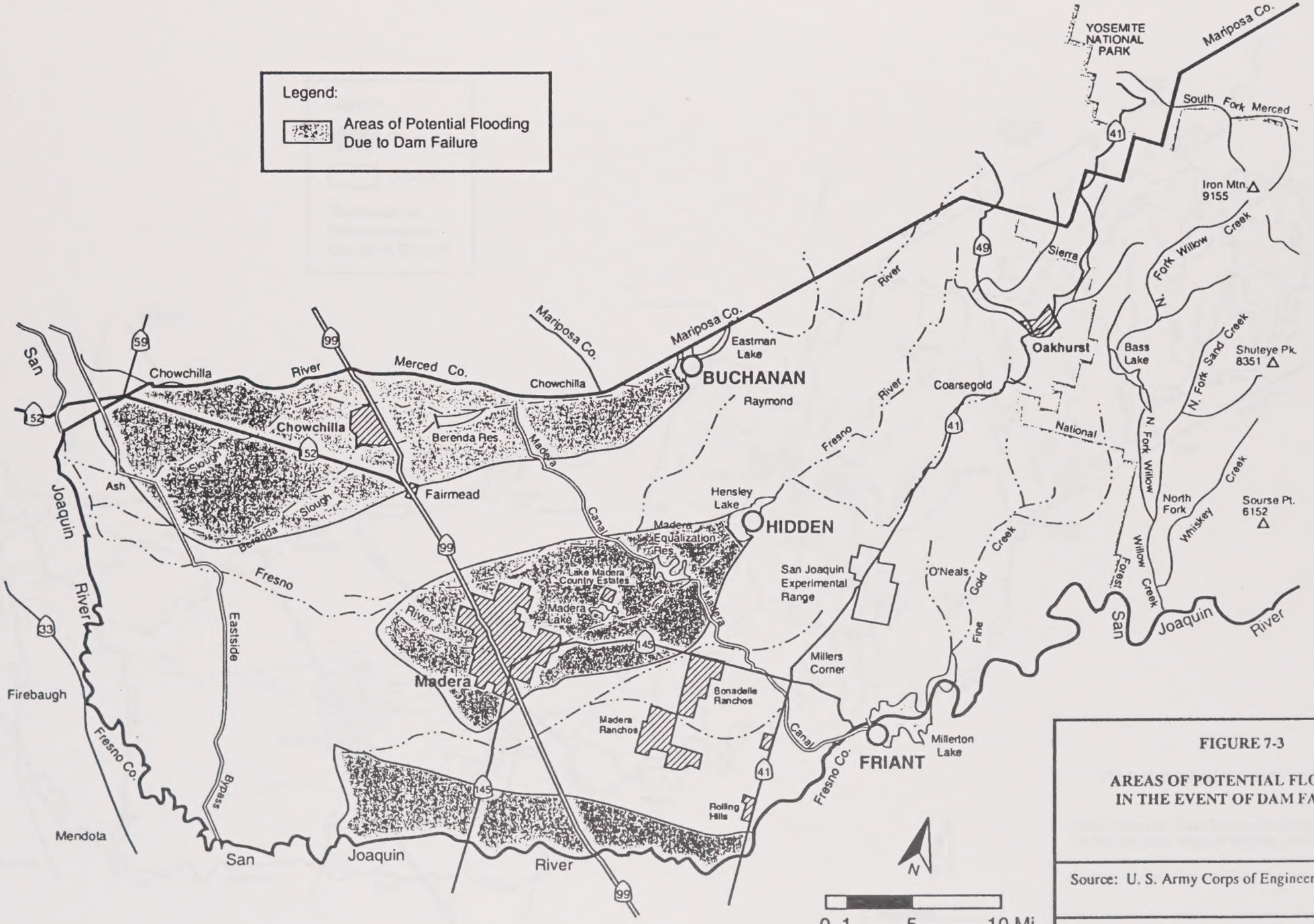

FIGURE 7-3

AREAS OF POTENTIAL FLOODING IN THE EVENT OF DAM FAILURE

Source: U. S. Army Corps of Engineers, 1991

Maps Prepared 8/93 by: H. T. Harvey & Associates

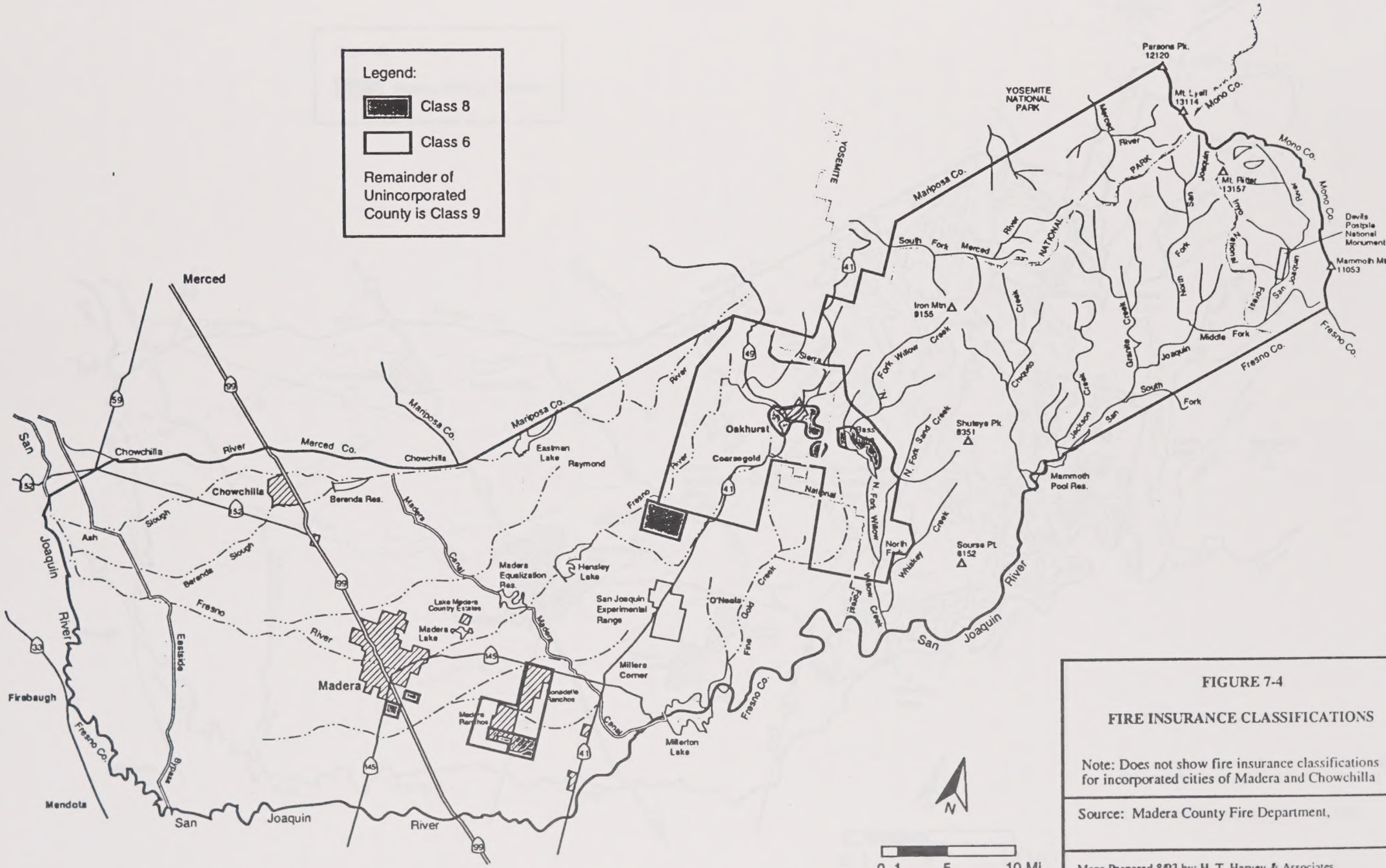

FIGURE 7-4

FIRE INSURANCE CLASSIFICATIONS

Note: Does not show fire insurance classifications for incorporated cities of Madera and Chowchilla

Source: Madera County Fire Department,

Maps Prepared 8/93 by: H. T. Harvey & Associates

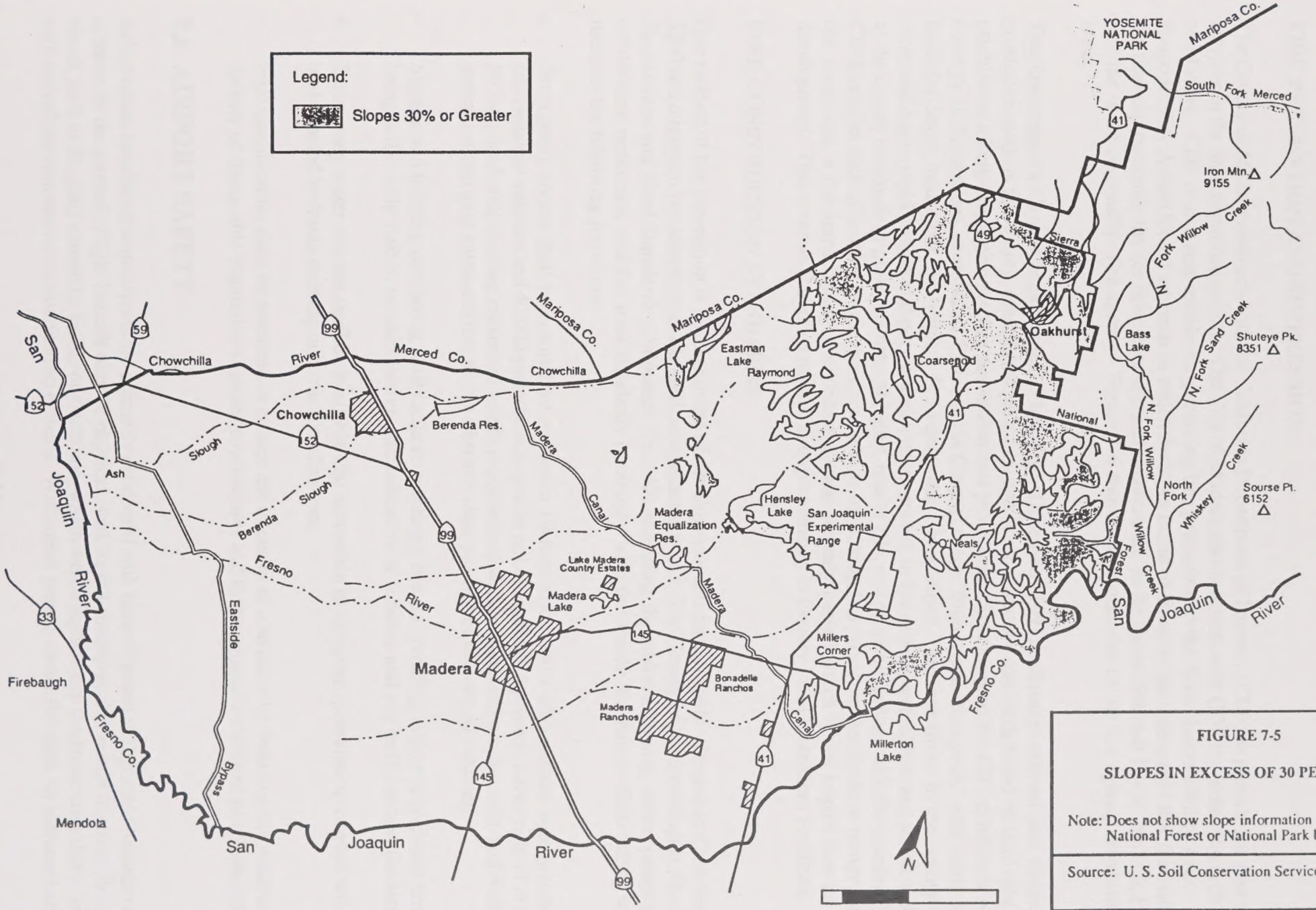

FIGURE 7-5

SLOPES IN EXCESS OF 30 PERCENT

Note: Does not show slope information for land within National Forest or National Park boundaries

Source: U. S. Soil Conservation Service, 1962

Maps Prepared 8/93 by: H. T. Harvey & Associates

FIRE PREVENTION AND SUPPRESSION

The County of Madera contracts with the California Department of Forestry (CDF) to provide fire protection services in the unincorporated county. The City of Madera also contracts with CDF for protection in the city of Madera. CDF is also responsible for providing fire protection to the State Responsibility Area. State Responsibility Areas (SRAs) are areas in which the State Board of Forestry has determined that the State has the financial responsibility for fire prevention and suppression. In the Sierra National Forest, the U.S. Forest Service is the responsible fire agency. Figure 7-6 shows the boundaries of the fire agency responsibility areas.

The Department's Capital Improvement Plan (CIP, December 1991) addresses current and future fire protection needs in the county, establishes priorities, sets level of service standards based on land uses, and establishes a long-range plan for fire prevention and protection. According to the CIP, conditions of the county's 16 fire stations, operated by CDF and the County, range "from excellent to poor," with many of the facilities being inadequate for housing fire equipment. In addition, response times in the county have increased due to rapid growth without a correspondent growth in fire protection facilities and staffing. Thus, as the county continues to grow, the risks of injury, loss of life, and property damage will also increase. The CIP identifies lack of funding as the main obstacle to improving fire protection services; in recognition of this constraint, a fire impact mitigation ordinance was recently passed which levies impact fees on new development. This revenue is applied to capital improvements in County Fire Department Facilities.

FIRE CONSTRUCTION STANDARDS

One method of fire prevention is the enactment of development standards. *Public Resources Code* Section 4290 sets minimum fire safety standards for development in SRAs. The County of Madera adopted *Fire-Safe Regulations and Road Standards* (Ordinance No. 542) amending the address, zoning, water, parcel map, subdivision ordinance, and the road standards to comply with the *Public Resources Code* 4290, which includes the following provisions:

- Emergency access shall be ensured by minimum 18-foot road widths with surface accommodating conventional vehicles and 40,000-pound loads, grades not exceeding 16 percent, curve radii of at least 50 feet, dead ends meeting maximum length requirements with turnouts and turnarounds, and roadway structures and gate entrances that do not obstruct clear passage of authorized vehicles.
- Signing and building numbering shall facilitate locating a fire and avoiding delays in response time by being sufficiently visible, nonduplicative, and indicative of location and any traffic access limitations.
- Emergency water sources shall be available and accessible in adequate quantities to combat wildfire with labeled hydrants meeting uniform specifications.
- Fuel modification shall be practiced to reduce the intensity of a wildfire by reducing the volume and density of flammable vegetation adjacent to structures and in the general vicinity of development.

7.5 AIRPORT SAFETY

Safety issues associated with airports are primarily concerned with hazards posed to flight and hazards posed to those on the ground. Flight hazards may be physical, such as tall structures that would obstruct airspace; visual, such as the glare caused by lights; or electronic, which would include any electronic uses that interfere with aircraft instruments or communication systems. With urban growth comes the need for increased airport

operations; increased activity generates increased aircraft crash hazards. However, with proper land use planning, these risks can be reduced or mitigated, mainly through avoidance of incompatible land uses.

There are two municipal airports located in Madera County: Madera Municipal Airport in the city of Madera and Chowchilla Municipal Airport in the city of Chowchilla. In addition to these two general aviation (licensed) facilities, there are several private agricultural air strips throughout the county. This section addresses potential threats to public safety associated with the county's two municipal airports.

MADERA COUNTY AIRPORT LAND USE COMPATIBILITY PLAN

The formation of airport land use commissions (ALUCs) was mandated in 1968 for all counties containing at least one public use airport (*Public Utilities Code* Sections 21670 et seq.) The commissioners represent the county, its cities, and the public. Their purpose is to "formulate a comprehensive plan that will provide for the orderly growth of each public airport and the area surrounding the airport that is within the commission's jurisdiction" (*Public Utilities Code* Section 21675). Legislation passed in 1982 established a direct link between ALUCs' comprehensive plans and land use plans and regulations prepared by cities and counties (*Public Utilities Code* 21676 et seq.) In accordance with this legislation, ALUCs must review general and specific plans of local jurisdictions for consistency with the county's airport comprehensive land use plan (CLUP).

The Madera County Airport Land Use Commission adopted an *Airport Land Use Compatibility Plan* for the two municipal airports in Madera County in November 1993. The airport planning area is divided into four traffic zones, called compatibility zones, which are determined by their location in relation to runways, approach/departure patterns, and common airport traffic (overflight zones). Each zone has certain acceptable and unacceptable uses, which are determined by the safety, noise, overflight, and airspace impacts associated with that particular zone. Figures 1-5 and Figure 1-6 in Chapter 1, *Land Use,* show the compatibility zones for the Madera Airport and Chowchilla Airports.

Zone A is comprised of the area immediately surrounding the runways; it is the most sensitive zone in the planning area, as it is associated with the highest safety risks. This zone is the Runway Protection Zone, or "clear zone," within which no development is permitted. The dimensions of this zone differ according to FAA standards for proposed future dimensions of the particular runway. "Normally acceptable uses" are those which attract low densities, and include aircraft tiedown aprons, pastures, field crops, vineyards, and automobile parking. "Not normally acceptable" uses are those that would obstruct safe takeoff and landing of aircraft, such as heavy poles, large trees, and signs.

Zones B1 and B2 comprise the Approach/Departure Zone, which is associated with "substantial" and "significant" risk, respectively. Aircraft commonly fly below 400 feet above ground level (AGL) or within 1,000 feet of the runway in zone B1, and below 800 feet AGL in zone B2. Generally allowable uses include those listed for zone A, in addition to any agricultural use, except those that attract large numbers of birds; warehousing and truck terminals; and single-story offices. Unacceptable uses include suburban residential subdivisions; intensive retail, manufacturing or food processing; two-story offices; and hotels and motels.

Zone C is the Common Traffic Pattern, or overflight Zone, and is associated with "limited risk." Aircraft fly at or below 1,000 feet AGL. Generally allowable uses include all uses permitted in zones A and B, as well as parks; playgrounds; low-intensity office, retail, manufacturing, and food processing; and two-story motels. Unacceptable uses include shopping malls, theaters, auditoriums, sports stadiums, and office buildings with four or more stories. In other words, high-density uses are not permitted.

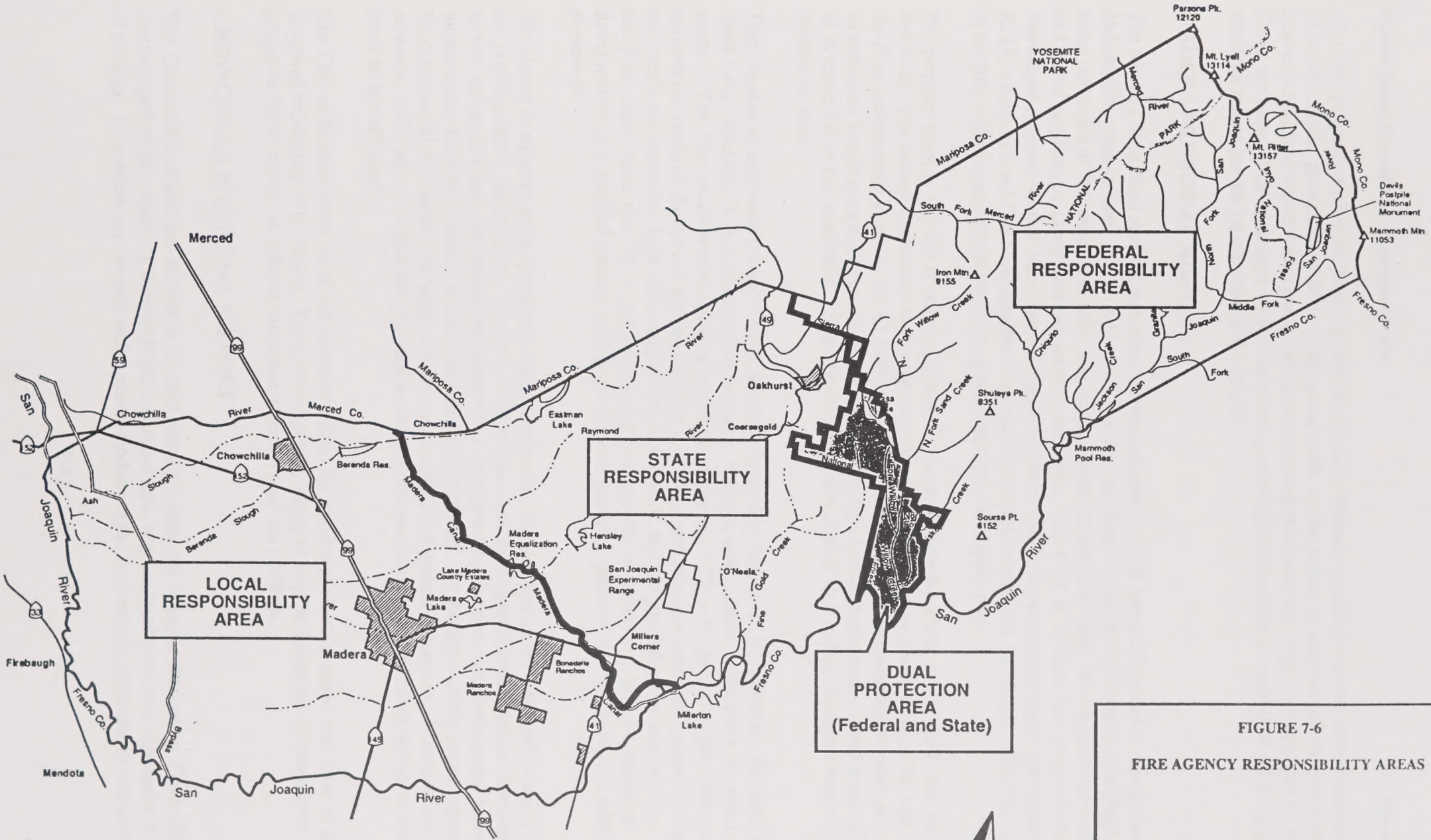

FIGURE 7-6

FIRE AGENCY RESPONSIBILITY AREAS

Source: Madera County Fire Department, 1993

Maps Prepared 8/93 by: H. T. Harvey & Associates

All of the property within the planning area is subject to frequent overflight at low altitudes (defined as "at or below traffic pattern altitude"). This poses risks to the safety of individuals on the ground; thus, conversion of land within the airport planning area to residential uses is strongly discouraged by the ALUC. There are areas of development within the existing overflight zones that preceded the ALUC plan. These areas are not under the jurisdiction of the ALUC.

MADERA MUNICIPAL AIRPORT

The Madera Municipal Airport encompasses approximately 1,046 acres, 595 acres of which are currently dedicated to aviation uses. It is located entirely within the limits of the city of Madera, approximately three miles northwest of the center of the city. The facility accommodates medium, twin-engine business turbojets, and aerial applicators (crop dusters) on two runways. The City of Madera has prepared the *Madera Municipal Airport Master Plan Report* (adopted March 1993), in accordance with the Madera County ALUC's *Airport Land Use Compatibility Plan*, as a more detailed plan for the airport. The *Plan* referred to in the following paragraphs is the City's plan rather than the ALUC plan.

The primary runway (12-30) is oriented in a southeast-northwest direction, and is 4,500 feet long and 150 feet wide. The current dimensions of this runway are sufficient to meet projected need in the near future, but the *Plan* recommends planning for a 1,500-foot extension in order to accommodate corporate aircraft. Such an extension would mandate either the relocation of Avenue 17 to the northwest, or the closure of a portion of Avenue 16 to the southwest. A southwest extension would also reduce compatibility with existing residential uses.

There is also an east-west runway (7-25), which is 3,980 feet long and 150 feet wide. Because it does not meet FAA standards, it is a restricted use runway, which is used almost exclusively by aerial applicator aircraft. The *Plan* recommends reducing the width of runway 7-25 to 60 feet, since the current dimension exceeds the needs of the type of aircraft utilizing it. The airport plan also specifies a possible third runway that would accommodate light, twin-engine propeller aircraft, and run parallel to the main runway. However, the *Plan* also states that "it is not anticipated that growth in operations will be sufficient to justify development of a parallel runway during the 20-year planning period;" the option should nonetheless be preserved.

The airport is adjacent to the developing edge of the city. Areas to the north, west, and south of the airport are predominantly agricultural. The area to the southeast of the airport contains limited development, but further residential and commercial development is anticipated for the area, and "substantial investments in infrastructure have been made," according to the County's CLUP. To the north of the airport, up to Highway 99, commercial, industrial, and higher density residential development is planned. Development within the common traffic zones poses a safety hazard in terms of the potential for human injury or loss of life resulting from an aircraft crash.

The City of Madera owns all of the property within the runway protection zones, and most of that within proposed extensions of the zones. The City is currently trying to acquire the unincorporated land within the proposed future zones, in order to minimize potential land use conflicts.

CHOWCHILLA MUNICIPAL AIRPORT

The Chowchilla Municipal Airport is located entirely within the limits of the city of Chowchilla, in the northern part of the county. It is close to the urbanized area, approximately one mile southeast of the center of the city. It contains one runway which accommodates light, twin-engine propeller-driven aircraft.

Areas slated for development, to the north and east of the airport, pose safety concerns since they lie partially within the risk zones delineated by the *Airport Land Use Compatibility Plan*. These areas include zoning for commercial/institutional, single and multi-family residential, and industrial uses. There are also some safety concerns in the areas to the southeast of the airport, which are zoned for commercial and industrial development, and which also lie within the airport's risk zones.

The originally platted portion of Chowchilla is fully developed, and its eastern section (with Fourth Street as its western boundary) lies within the airport's B1 and C overflight zones. Existing uses in the urbanized area within these zones include heavy commercial, agricultural, institutional, part of the central business district, and residential uses of various densities. All of the areas within these zones are subject to hazards associated with aircraft crash.

7.6 HAZARDOUS WASTE

Hazardous waste is defined as any waste material that is a potential threat to human health and environment, having the capacity to cause serious illness or death (*Health and Safety Code* Section 25117). Because Madera County is a rural county, the risks associated with hazardous waste are lower than in more urban counties. However, in the event of a hazardous materials incident, the county would have to draw on outside resources. The County *Emergency Response Plan* estimates that "significant out-of-county assistance will be unavailable for a period of two to six hours" in the event of a major catastrophic incident.

MADERA COUNTY HAZARDOUS WASTE MANAGEMENT PLAN

Madera County has prepared a *Hazardous Waste Management Plan* (adopted January 1989) in accordance with *Health and Safety Code* Section 24135 et seq., which states that counties may prepare such plans "for the management of all hazardous waste produced in the county," as well as a plan for the siting of new facilities. County Hazardous Waste Management Plans (HWMPs) are to be integrated with other local land use planning efforts. These plans were originally to be reviewed by the State Department of Health Services (DHS). Subsequent to the formation of the California Environmental Protection Agency (CalEPA) in 1991, County Hazardous Waste Management Plans are now to be submitted to the CalEPA's Department of Toxic Substances Control.

The County's HWMP identifies hazardous waste generators within the county, amounts and types of waste produced, and projected waste generation. In addition, the plan identifies the need for and potential future locations of treatment, storage, and disposal (TSD) facilities; and includes policies and potential impacts for the management of hazardous waste within the county. The major goal of the HWMP is to reduce the need for new hazardous waste facilities by reducing waste at its source, through recycling, reduced use of hazardous materials, and public education.

HAZARDOUS WASTE PRODUCTION AND DISPOSAL

Hazardous waste generators in Madera County include industries, businesses, public and private institutions, and households. In 1986, waste oil comprised the largest percentage of hazardous waste generated in Madera County. There are three generators in the county that have been identified by the Department of Health Services (DHS) as "large quantity" generators, or those which produce 1,000 kilograms or more per month:

- Certainteed Corporation - fiberglass manufacturer
- Western Farm Services - this company sells farming chemicals (mainly pesticides)

- Oakhurst Substation of PG&E - most of the waste reported from this site consisted of contaminated soil that resulted from a site clean-up. The County HWMP states that since this was a one-time generation, the site is not considered a large quantity generator.

In addition to these sites, an independent survey conducted by the County identified four more sites in this category:

- Madera Cars Unlimited
- Madera Glass Company
- T.G.P. Diesel Repair, Inc.
- McCulley Oil Company

"Small quantity" generators in the county, or those producing less than 1,000 kilograms per month, include various businesses, farms, and households. The Madera County Planning Department conducted a survey in October of 1987 to determine waste generators in this category, as well as the amount of waste produced, and methods of disposal. This survey concluded that waste oil is the most significant waste generated by businesses and farms, comprising approximately 40 percent of all waste produced, 74 percent of which is recycled. The remaining 26 percent is either burned, or applied to the ground as a method of weed and dust control (the HWMP states that the "latter methods are more common among farmers").

The HWMP identifies a third category, "household wastes" which includes "solvents, pesticides, and miscellaneous wastes such as car batteries, tires, cleaners, fertilizer, paint, etc." Because no facilities currently exist to dispose of these types of substances, they are often disposed of illegally along with household solid wastes. However, the County currently has a load checking program in place, which attempts to determine the source of hazardous waste disposed of in solid waste facilities, and sends the material back to the source. The County then urges use of the entire product, and provides advice on where to dispose of the material.

CONTAMINATED SITES

Contaminated sites are those containing unacceptable levels of toxic substances that would pose risks to health and safety. The Department of Health Services identified nine contaminated sites in the county as of 1987. Six of the sites contain underground gasoline tank leaks, two are "contaminated with Pentechlorophenol (PCP) and pesticides," and one contains a contaminated well. The County Environmental Health Department has identified a seventh underground gasoline tank leak on a tenth site. The seven underground tank sites are not discussed in the HWMP, because the Air Pollution Control District allows aeration of the soil for such sites; the HWMP maintains that since no soil is removed from the site under this procedure, the site is not classified as a hazardous waste generator. For the same reason, the contaminated well, which has been abandoned, is not discussed as a generator in the HWMP. The two remaining sites discussed are the Madera Municipal Airport and McGillis and Gibbs Company.

Madera Municipal Airport

The Madera Municipal Airport is located between Avenues 16 and 17, and Roads 23 and 24, west of Highway 99. It has been used by crop dusters for thirty years, causing "an accumulation of pesticide residues in certain storage areas and in the wash site."

Adjacent land is designated by the city of Madera as agricultural resource conservation (RC(Ag)), service commercial (SC), industrial (I), and office (O). There is also a golf course on the western edge of the site.

Madera County does not have jurisdiction over the site and immediately adjacent lands, since they are entirely within the limits of the City of Madera. This site is on the DHS's active list, but because of funding constraints, the City of Madera has no immediate plans to clean up the site.

McGillis and Gibbs Company

McGillis and Gibbs is near the community of Trigo on Road 32 in the southern part of the county. The company uses hazardous chemicals for the treatment of wood. These chemicals, in addition to PCP and diesel fuel, have created a localized groundwater problem. Because groundwater contamination occurred in a perched zone, regional water supply was not affected. The site was placed on the Department of Health Services' cleanup list; cleanup is currently underway and expected to be completed by 1995.

Both of these sites contain polluted soil, and possibly polluted groundwater, and constitute potential threats to human health and safety. Future development in these areas could only occur on the condition that hazardous materials are removed from the sites. The County's Hazardous Waste Management Plan states that there are "no locally adopted policies regarding contaminated sites" and they do not always show up on zoning maps.

TREATMENT, STORAGE, AND DISPOSAL FACILITIES

There are no treatment, storage, and disposal (TSD) facilities in Madera County. Certainteed Corp. is the only licensed storage facility in the county, and it does not accept waste produced off-site. In 1986, approximately 90 percent of all hazardous waste generated in the county was transported to facilities outside the county. Counties containing facilities which accept hazardous waste from Madera County include Stanislaus, Alameda, Kings, and Los Angeles. It is estimated that the remaining 10 percent of hazardous waste generated in the county in 1986 was disposed of illegally on-site.

The HWMP has identified six suitable sites for locating TSD facilities for use by Madera County as well as surrounding counties. Siting of new regional TSD facilities would be based on a "fair share" policy, where regional jurisdictions would take into consideration their contribution to the waste stream, environmental suitability, and economic interests and viability. All of the suitable sites within Madera County, as identified in the HWMP, are near or along State Highway 99. None of the sites were suitable for residual repositories (disposal facilities), so two alternative sites were chosen as potential locations for residual repositories.

The HWMP includes the following criteria to determine feasible sites:

- Facilities should not be located in "high hazard" areas, or "those areas in which human and animal life could be jeopardized if fugitive release occurs." These areas include active/potentially active fault lines, floodplains, wetlands, unstable soils, major recharge areas for aquifers, habitats of endangered species, and areas near residences.
- Facilities "should have good access to major transportation routes."
- Distances from sources should be minimized, except in the case of repositories, which require a larger area.

These criteria serve to reduce some of the potential dangers associated with the treatment, storage, and disposal of hazardous materials. Safety risks are not, however, eliminated completely. Locating new TSD facilities within the county means greater amounts of waste being transported into the county from other areas, as well as general risk associated with the facility itself.

POTENTIAL TREATMENT AND STORAGE FACILITIES

TSD facilities are considered to be industrial facilities, and are treated as such in terms of locational considerations. Feasible sites identified in the HWMP are basically in industrial areas, and are adjacent to agricultural lands, with the exception of repository sites, which are slated for more isolated agricultural areas because of their spatial requirements.

Chowchilla Industrial Park

This site is located within the city of Chowchilla, south of the municipal airport. The site, as well as surrounding land, is designated for heavy industrial use in the City's General Plan. Access to Highways 99 and 152 is provided via Chowchilla Boulevard south to Avenue 24 or north to Robertson Boulevard.

Fairmead Site

Located on the northeast corner of the interchange of Highways 99 and 152, this area is currently zoned for heavy industrial use. Access to the area is provided through Chowchilla Boulevard and Avenue 24 to Highway 99 or Road 17½ to Highway 152. It can also be accessed via Southern Pacific Railroad.

Berenda Site

This is a very large site (approximately 1,920 acres) that is located just east of Highway 99 half way between the cities of Chowchilla and Madera. It is designated for heavy industry in the County's existing General Plan. Access to Highway 99 is provided from Avenue 20½. The site can also be accessed by the Santa Fe rail line.

Madera Airport Industrial Park

This site is located in the city of Madera, between Avenues 16 and 17, west of Highway 99. The area is designated for industrial use in the City's General Plan. It is accessed from Highway 99 to either Avenues 16 or 17.

Town and Country Industrial Park

This site is in the city of Madera. It is designated for industrial use by the City's General Plan. Surrounding unincorporated areas are currently designated as heavy industrial. There are residences to the north of the site but these are buffered by a park, and general commercial uses. Access is provided to Highway 99 through Road 25 and Avenue 12.

POTENTIAL REPOSITORY SITES

Two locations have been identified as suitable for residual repositories in the Environmental Impact Report of the County's *Hazardous Waste Management Plan*:

- Northeast corner of the intersection of Avenue 26 and Road 26, approximately 10 miles east of Highway 99.

- Southwest corner of the intersection of Avenue 26 and Road 29, approximately 12 miles east of Highway 99.

Both of these sites are in agriculturally-zoned areas, with access provided via Avenue 26. This is a two-lane road, and increased traffic created by such facilities would create safety risks associated with the transport of hazardous materials. However, the HWMP states that road improvements would be required if a facility were to be built.

TRANSPORT ROUTES

There are four major state highways in the county: Highways 99, 152, 145, and 41. In terms of the current transport situation, the major routes are Highway 99 and the two railroads, which transport thousands of tons of hazardous materials each year. Most of the suitable sites for future TSD facilities are on or near Highways 99 or 152. In addition, Southern Pacific and Santa Fe Railroads cross most of the site areas. Highway 145, which links Highways 41 and 99, has limitations, because it crosses the city of Madera before intersecting Highway 99; the potential for spills caused by accidents to affect large numbers of people is great. The HWMP identifies Avenue 12 as a more feasible link, although this route crosses a residential subdivision, which would be at risk for hazardous waste spills. The area along all of these routes is at risk of being affected by spills during transport, and this should be a consideration in terms of future development along the roadways.

7.7 EMERGENCY RESPONSE

Madera County has prepared a *Multi-Hazard Functional Plan* to serve as the County's emergency response plan. The plan addresses responses to various emergency incidents, responsibilities of various agencies, and sources of outside assistance. The following types of emergencies are addressed in the *Multi-Hazard Functional Plan.*

- Earthquakes
- Dam Failure
- Flood
- Wildfire
- War emergency
- Hazardous materials incident
- Aircraft crash
- Volcanic eruption

In the event of a disaster, certain facilities are critical to serve as evacuation centers, provide vital services, and provide for emergency response. Existing critical facilities in Madera County include hospitals, County dispatch facilities, electrical, gas, and telecommunication facilities, water storage and treatment systems, wastewater treatment systems, schools, and other government facilities. This plan also addresses evacuation routes, which includes all freeways, highways, and arterials that are outside of the 100-year flood plain.

As of mid-1995, the County is in the process of preparing a new emergency response plan jointly with the cities of Madera and Chowchilla to reflect adopted plans and projected growth in the city.

7.8 FINDINGS

- While there are no known active or potentially active faults within Madera County, there are two significant faults within the larger region that have been, and will continue to be, the principal sources of potential seismic activity within Madera County: the San Andreas Fault and the Owens Valley Fault system.

- Groundshaking is the primary seismic hazard in Madera County, because of the county's seismic setting and its record of historical activity. Structures located in the valley will tend to suffer greater damage from groundshaking than those located in the foothill and mountain areas.

- Areas of fracturing and steep slopes with inadequate ground cover in the foothill and mountain areas are prone to landsliding. There is no risk of large landslides in the valley area of the county, since it is essentially flat and topographically featureless. There is, however, potential for small slides and slumping along the steep banks of rivers and creeks.

- Principal flood problems in Madera lie along Cottonwood, Root, Dry, North Fork, Willow, and Schmidt Creeks, and the Schmidt Creek Tributary. All have perennial flow, and all of the channels are poorly defined and subject to flooding. The construction of Buchanan, Hidden, and Friant Dams, as well as levee improvements along the sloughs and rivers, have eliminated major flooding problems along the San Joaquin, Fresno, and Chowchilla Rivers.

- For fire insurance purposes, the city of Madera maintains an ISO rating of 4, and some small areas of the unincorporated county maintain a 6. The Coarsegold, Oakhurst, Ahwahnee, Bass Lake, and North Fork areas are classified with ratings of 8. The remainder of the county currently has a rating of 9.

- The Madera County Airport Land Use Commission adopted an *Airport Land Use Compatibility Plan* for the two municipal airports in Madera County in November 1993. The airport planning area is divided into four traffic zones, called compatibility zones, which are determined by their location in relation to runways, approach/departure patterns, and common airport traffic (overflight zones). Each zone has certain acceptable and unacceptable uses, which are determined by the safety, noise, overflight, and airspace impacts associated with that particular zone.

- Major hazardous waste generators in the county include industries, businesses, public and private institutions, and households. In 1986, waste oil comprised the largest percentage of hazardous waste generated in Madera County.

- Several potential sites for hazardous waste treatment and storage facilities were identified in the County's *Hazardous Waste Management Plan* within industrially-designated areas. Two potential sites for residual repositories were also identified within agricultural areas.

- Madera County's *Multi-Hazard Functional Plan* serves as the County's emergency response plan. The plan addresses responses to earthquakes, dam failure, flood, wildfire, war emergency, hazardous materials incident, aircraft crash, and volcanic eruption. This plan is undergoing revision as of 1995.

7.9 PERSONS CONSULTED

Bailey, James, California Department of Water Resources

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Kirn, Mike, County of Madera Engineering Department

Mancebo, Bill, California Department of Water Resources

Martin, Roger, Chief, Environmental Review, Division of Mines and Geology, California Department of Conservation

Red, Larry, Community Development Director, City of Madera

Scheider, Sam, Airport Manager, Madera Municipal Airport

Shaddy, Kevin, California Department of Health Services

Yarwood, Mel, U.S. Army Corps of Engineers

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7.11 GLOSSARY

Active Fault - A fault that has moved recently and which is likely to move again. For planning purposes, "active fault" is usually defined as one that shows movement within the last 11,000 years and can be expected to move within the next 100 years.

Alluvial - Pertaining to or composed of alluvium, or deposited by a stream or running water.

Alluvium - A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its flood plain or delta, or as a cone or fan at the base of a mountain slope.

Beds; Bedding - Layers in sedimentary rocks distinguished from one another on the basis of rock type, grain size, composition, color, etc.

Compaction - Reduction in bulk volume or thickness of, or the pore space within, a body of fine-grained sediments in response to the increasing weight of overlying material that is continually being deposited, or to the pressure resulting from earth movements within the crust. It is expressed as a decrease in porosity brought about by a tighter packing of the sediment particles.

Consolidated Material - Soil or rocks that have become firm as a result of compaction.

Earthquake - Perceptible trembling to violent shaking of the ground, produced by sudden displacement of rocks below and at the earth's surface.

Epicenter - An area of the surface of the earth directly above the focus of an earthquake.

Erosion - Movement of material (such as soil) from one place to another on the earth's surface. Agents of movement include water, ice, wind, and gravity.

Fault - A fracture in the earth's crust forming a boundary between rock masses that have shifted.

Fault System - Two or more interconnecting fault sets.

Fault Trace - The intersection of a fault with the earth's surface.

Fault Zone - A zone in which surface disruption or rock fracture has occurred due to movement along a fault. A fault zone may be expressed as an area with numerous small fractures, breccia (essentially, fractured rock) as a fault gouge. A fault zone may be anywhere from a few meters (or yards) to two or more kilometers (1 mile or more) wide.

Fire Hazard Zone - An area where, due to slope, fuel, weather, or other fire-related conditions, the potential loss of life and property from a fire necessitates special fire protection measures and planning before development occurs.

Ground Failure - Mudslide, landslide, liquefaction, or the seismic compaction of soils.

Hazardous Material - An injurious substance, including pesticides, herbicides, toxic metals and chemicals, liquified natural gas, explosives, volatile chemicals, and nuclear fuels.

Inactive Fault - A fault which shows no evidence of movement in recent geologic time and no potential for movement in the relatively near future.

Intensity (of an earthquake) - A measure of the effects of earthquake waves on man, structures, and the earth's surface at a particular place. The intensity at a specific point depends not only upon the strength of the earthquake, or the earthquake magnitude, but also upon the distance from the point to the epicenter and the local geology. Intensity may be contrasted with magnitude, which is a measure of the total energy released by an earthquake.

Landslide - A general term for relatively rapid mass movement, such as slump, rock slide, debris slide, mudflow, and earthflow.

Lateral Spreading - The movement of loose soils over horizontal or low-angle slopes into open areas, caused by ground motion during an earthquake.

Liquefaction - A process by which water-saturated granular soils transform from a solid to a liquid state because of a sudden shock or strain.

Lurch Cracking - The development of all types and sizes of fissures in the ground, due to ground motion during an earthquake.

Magnitude (Earthquake) - A measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic observations. As defined by Richter, it is the logarithm, to the base 10, of the amplitude in microns of the largest trace deflection that would be observed on a standard torsion seismograph at a distance of 100 kilometers from the epicenter.

Potentially Active Fault - (1) A fault that moved within the Quaternary Period before the Holocene Epoch (the last 2,000,000 to 11,000 years); (2) A fault which, because it is judged to be capable of ground rupture or shaking, poses an unacceptable risk for a proposed structure.

Seiche - An earthquake-induced wave in a lake, reservoir, river, or harbor.

Seismic - Pertaining to earthquakes.

Settlement - The downward movement of soils, and structures on them or in them, resulting from reduction in the voids in the underlying soils.

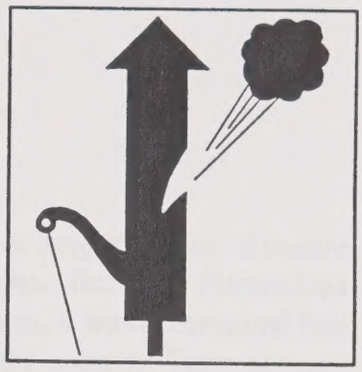
Shear - A kind of fracture (or fault) in rock produced by intense pressure.

Subsidence - The gradual, local settling or sinking of the earth's surface with little or no horizontal motion. (Subsidence is usually the result of gas, oil, or water extraction, hydrocompaction, or peak oxidation, and not the result of a landslide or slope failure.)

Surface Rupture - A break in the ground's surface and associated deformation resulting from the movement of a fault.

Water Table - The upper surface of saturated earth material below which all the materials are saturated.

Wildland - A nonurban, natural area which contains uncultivated land, timber, range, watershed, brush, or grasslands.



CHAPTER 8

NOISE

CHAPTER 8

NOISE

8.1 INTRODUCTION

This chapter provides background information on the data and methods used to prepare noise exposure information for major noise sources within Madera County for existing conditions. Based on discussions with Madera County staff and field studies conducted by Brown-Buntin Associates, it was determined that there are a number of potentially significant sources of community noise within the county. These sources include traffic on state highways, major county roadways, railroad operations, airport operations and industrial facilities. Specific noise sources selected for study are discussed in the following sections. Figure 8-1 shows the generalized locations of major noise sources selected for study.

Analytical noise modeling techniques in conjunction with actual noise level measurements were used to develop generalized noise exposure contours for major sources of noise within Madera County for existing conditions. Analytical noise modeling techniques generally make use of source-specific data including average levels of activity, hours of operation, seasonal fluctuations, and average levels of noise from source operations. Analytical methods have been developed for many environmental noise sources including roadways, railroad line operations, industrial plants and aircraft/airport operations. Such methods will produce reliable results as long as data inputs and assumptions are valid for the sources being studied. The analytical methods used in this chapter closely follow recommendations made by the State Office of Noise Control, and were supplemented, where appropriate, by source-specific sound level data to account for local conditions.

It should be noted that the noise exposure contours shown or described in this chapter are generally based upon annual average conditions (unless otherwise stated), and are not intended to be site-specific where local topography, vegetation or intervening structures may significantly affect noise exposure at a given receiver location. The contours should be used as a screening device when determining whether a project may result in a noise-related land use conflict. Generally, a site-specific study will be required to determine noise exposure in situations involving complex topography or shielding by buildings or vegetation.

The glossary of this chapter provides a description of the acoustical terminology used in this chapter. Unless otherwise stated, all sound levels reported are in A-weighted decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighting, as it provides a high degree of correlation with human annoyance and health effects.

8.2 STATE HIGHWAYS AND MAJOR COUNTY ROADWAYS

The Federal Highway Administration (FHWA) *Highway Traffic Noise Prediction Model* (FHWA-RD-77-108) was used to develop L_{dn} contours for the state highways and major county roadways within the unincorporated areas of Madera County. The FHWA Model is the analytical method favored for traffic noise prediction by most state and local agencies, including Caltrans. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 axles or more), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within ±1.5 dB. To predict L_{dn} values,

it is necessary to determine the hourly distribution of traffic for a typical 24-hour day and adjust the traffic volume input data to yield an equivalent hourly traffic volume. The FHWA Model has indicated that the model generally overpredicts traffic noise exposure by 1-2 dB in areas 100-200 feet from the center of roadways, and its use generally results in a conservative estimate of traffic noise exposure.

Traffic data representing annual average traffic volumes and truck mix for existing conditions were obtained from the California Department of Transportation (Caltrans) and the Madera County Road Department. Estimates of the day/night distribution of traffic for a typical 24-hour period on state highways were obtained from Caltrans. Brown-Buntin Associates made assumptions concerning the day/night distribution for county roads since these data were not available from other sources. Appendix B shows a summary of the traffic data used for the calculation of traffic noise exposure. These data along with the FHWA Model were used to calculate the distance between the center of the roadways and the 60, 65, and 70 dB L_{dn} contours for existing traffic conditions. Calculated distances to L_{dn} contours are shown in Table 8-1. Roadway segments listed in Table 8-1 refer to the traffic data print-out summarized in Appendix B. The approximate locations of the 60 dB L_{dn} contours for existing traffic conditions are shown on maps in Appendix D. It should be noted that since calculations did not take into consideration shielding caused by local buildings or topographical features, the distances reported in Table 8-1 and depicted in Appendix D should be considered as worst-case estimates of noise exposure along roadways in the county. Noise exposure behind the first row of houses or other types of buildings along a roadway will typically be reduced by 5-15 dB.

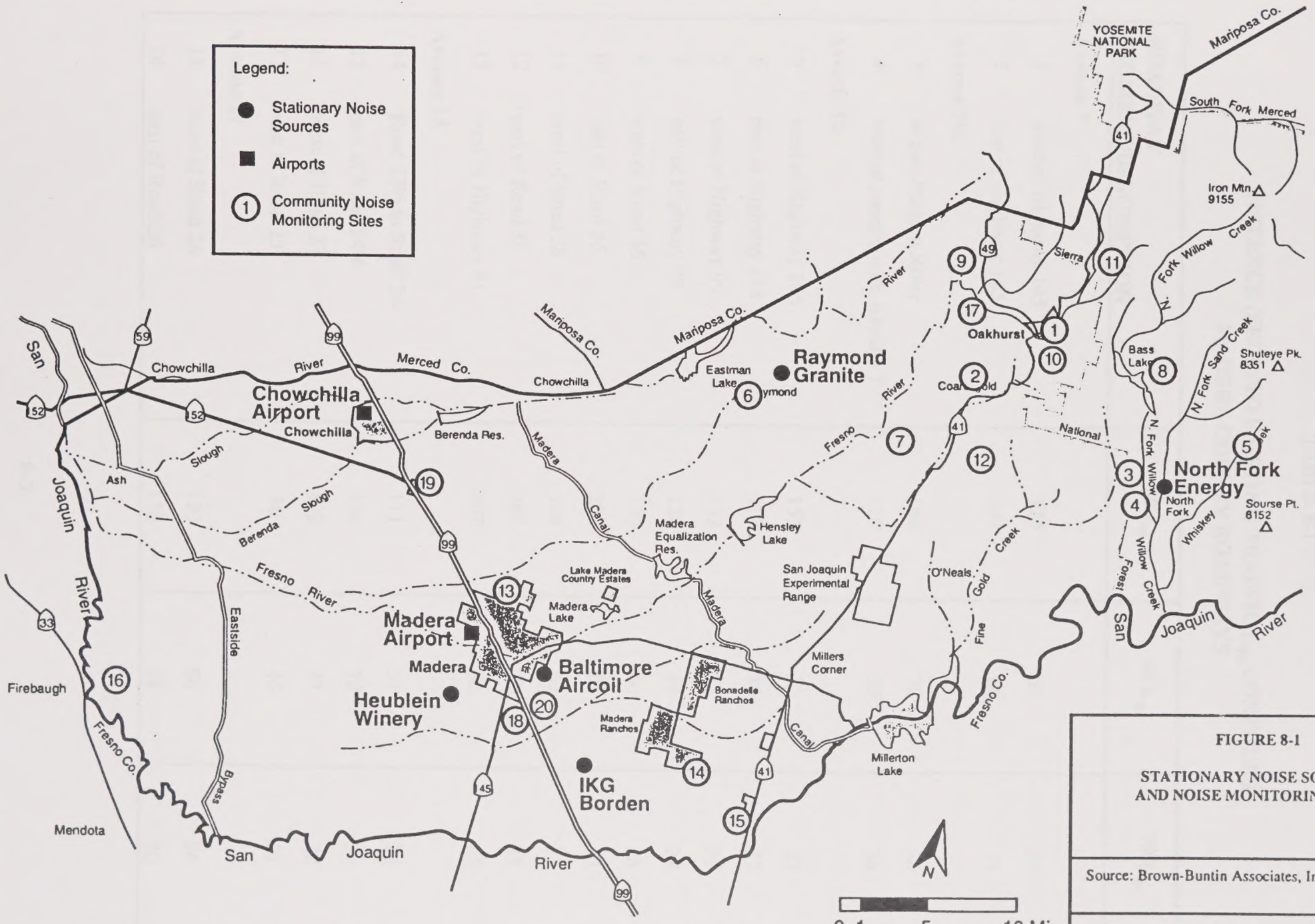


FIGURE 8-1

STATIONARY NOISE SOURCES AND NOISE MONITORING SITES

Source: Brown-Buntin Associates, Inc.

Maps Prepared 8/93 by: H. T. Harvey & Associates

TABLE 8-1

DISTANCE (FEET) TO EXISTING TRAFFIC L_{dn} CONTOURS MADERA COUNTY ROADWAYS

ROADWAY SEGMENT/DESCRIPTION		60 L_{dn}	65 L_{dn}	70 L_{dn}
Avenue 7				
1	west of Highway 145	125	58	27
2	east of Highway 145	142	66	31
Avenue 7½				
3	at San Joaquin River	168	78	36
4	west of merger with Avenue 7	119	55	26
Avenue 12				
5	west of Highway 145	155	72	33
6	east of Highway 145	173	80	37
7	west of Highway 99	162	75	35
8	east of Highway 99	128	59	28
9	west of Road 36	130	60	28
10	east of Road 36	202	94	43
11	west of Road 38	144	67	31
12	east of Road 38	162	75	35
13	west of Highway 41	207	96	45
Avenue 14				
14	Road 23½ to Road 24	111	51	24
15	east of Road 24½	156	72	34
16	west of Road 23	102	47	22
17	east of Road 23	99	46	21
Avenue 17				
18	west of Road 26	120	56	26
19	east of Road 26	138	64	30

TABLE 8-1 (Continued)

DISTANCE (FEET) TO EXISTING TRAFFIC L_{dn} CONTOURS
MADERA COUNTY ROADWAYS

ROADWAY SEGMENT/DESCRIPTION		60 L_{dn}	65 L_{dn}	70 L_{dn}
Road 26				
20	north of Avenue 13	95	44	20
21	north of Cleveland	331	154	71
22	north of Sherwood	325	151	70
23	north of Adell St.	191	89	41
24	south of Avenue 17	155	72	33
25	north of Avenue 17	130	60	28
Road 36				
26	north of Avenue 12	122	57	26
Road 222				
27	south of Road 225	166	77	36
28	at Highway 41	162	75	35
Road 415				
29	west of Coarsegold	91	42	20
30	at Highway 41	125	58	27
Road 426				
31	at Highway 41	186	87	40
32	at Fresno River	121	56	26
33	west of Road 425B	154	72	33
34	east of Road 425B	148	69	32
State Route 41				
35	south County line to Rte 145	278	129	60
36	Rte 145 Rte 99	178	83	38
37	Rte 49 to Road 426	271	126	58
38	Road 426 to Bass Lake Rd.	198	92	43

TABLE 8-1 (Continued)

DISTANCE (FEET) TO EXISTING TRAFFIC L_{dn} CONTOURS
MADERA COUNTY ROADWAYS

ROADWAY SEGMENT/DESCRIPTION		60 L_{dn}	65 L_{dn}	70 L_{dn}
State Route 49				
39	Rte 41 to Road 628	106	49	23
State Route 59				
40	Jct Rte 152	148	69	32
State Route 99				
41	south county line to Gateway Dr.	1,299	603	280
42	Avenue 17 to north county line	947	439	204
State Route 145				
43	Avenue 13 to Jct Rte 99	241	112	52

Source: Brown-Buntin Associates, Inc., 1993

Table 8-2 shows the distances to the existing and future 60 dB L_{dn} traffic noise contours. This table also shows the relative change in noise levels from existing and future sources.

TABLE 8-2

TRAFFIC NOISE DATA
DISTANCE (FEET) FROM CENTER OF ROADWAY
TO 60 dB L_{dn} CONTOURS AND NOISE LEVEL CHANGE
1990 and 2010

Roadway Segment/Description	Existing (1990)	Future (2010)	Change, dBA Existing vs. Future
Avenue 7			
1 west of Highway 145	125	186	+3.5
2 east of Highway 145	142	200	+2.2
Avenue 7½			
3 at San Joaquin River	168	---	---
4 west of merger with Avenue 7	119	---	+3.2
Avenue 12			
5 west of Highway 145	155	173	+0.7
6 east of Highway 145	173	249	+2.3
7 west of Highway 99	162	271	+3.4
8 east of Highway 99	128	603	+10.1
9 west of Road 36	130	227	+3.6
10 east of Road 36	202	272	+1.9
11 west of Road 38	144	274	+4.2
12 east of Road 38	162	339	+4.9
13 west of Highway 41	207	332	+3.1
Avenue 14			
14 Road 23½ to Road 24	111	106	-0.3
15 east of Road 24½	156	224	+2.9
16 west of Road 23	102	115	+0.8
17 east of Road 23	99	106	+0.4

TABLE 8-2 (Continued)

TRAFFIC NOISE DATA
DISTANCE (FEET) FROM CENTER OF ROADWAY
TO 60 dB L_{dn} CONTOURS AND NOISE LEVEL CHANGE
1990 and 2010

Roadway Segment/Description		Existing	Future	Change, dBA Existing vs. Future
Avenue 17				
18	west of Road 26	120	292	+5.8
19	east of Road 26	138	233	+3.4
Road 26				
20	north of Avenue 13	95	48	-4.4
21	north of Cleveland	331	590	+3.8
22	north of Sherwood	325	418	+1.6
23	north of Adell St.	191	418	+5.1
24	south of Avenue 17	155	337	+5.1
25	north of Avenue 17	130	220	+3.4
Road 36				
26	north of Avenue 12	122	220	+3.8
Road 222				
27	south of Road 225	166	145	-0.9
28	at Highway 41	162	232	+2.4
Road 415				
29	west of Coarsegold	91	---	---
30	at Highway 41	125	---	---
Road 426				
31	at Highway 41	186	169	-0.7
32	at Fresno River	121	169	+2.2
33	west of Road 425B	154	292	+4.8
34	east of Road 425B	148	292	+4.4

TABLE 8-2 (Continued)

TRAFFIC NOISE DATA
DISTANCE (FEET) FROM CENTER OF ROADWAY
TO 60 dB L_{dn} CONTOURS AND NOISE LEVEL CHANGE
1990 and 2010

Roadway Segment/Description	Existing	Future	Change, dBA Existing vs. Future
State Route 41			
35 south County line to Rte 145*	278	365	+1.7
36 Rte 145 Rte 99	178	229	+1.6
37 Rte 49 to Road 426	271	457	+3.4
38 Road 426 to Bass Lake Rd.	198	277	+2.1
State Route 49			
39 Rte 41 to Road 628	106	153	+2.4
State Route 59			
40 Jct Rte 152	148	---	---
State Route 99			
41 south county line to Gateway Dr.	1299	2063	+3.0
42 Avenue 17 to north county line	947	1451	+2.8
State Route 145			
43 Avenue 13 to Jct Rte 99	241	398	+3.3

*Varies along the roadway segment
--- Traffic data not available

Source: Brown-Buntin Associates, Inc.

8.3 RAILROAD NOISE

Railroad operations in Madera County consist of high speed mainline operations on the Atchison, Topeka and Santa Fe (AT&SF) Railway and Southern Pacific Transportation Company (SPRR) and a low speed branchline of the SPRR southwest of the City of Madera.

To quantify noise exposure, as defined by L_{dn}, for frequent high speed operations on the AT&SF Railway and SPRR, the analytical methods developed in 1973 by Wyle Laboratories (Wyle Laboratories Report WCR-73-5) for railroad line operations were used. The Wyle methodology considers the composition of

trains, frequency of operation, day/night distribution of operations, track characteristics and speed of trains in the calculation of L_{dn}.

Following is a description of the operation of each railroad serving Madera County. Estimates of noise exposure, as defined by L_{dn}, are discussed in the text. For railroads where the nature of the operation results in significant noise exposure, the 60 dB L_{dn} contours for existing railroad operations are shown on the noise contour maps in Appendix D.

AT&SF RAILROAD

The AT&SF mainline passes through Madera County in a generally north-south direction. Mainline operations affect scattered residences in rural areas near the tracks. According to the Chief Dispatcher's office in Fresno, there are presently an average of 20 freight and 8 passenger trains per day in this area. Maximum speed is 70 mph for freights and 79 mph for passenger trains. Freight trains may occur at any time during the day or night, and passenger trains generally operate during the daytime hours (7:00 am-10:00 pm). According to the Wyle methodology, the above-described type and frequency of operations will result in noise exposures of 65 and 60 dB L_{dn} at approximately 370 and 690 feet, respectively, from the center of the tracks. Noise levels in the vicinity of grade crossings are somewhat higher than this due to the use of the warning horn.

SOUTHERN PACIFIC RAILROAD

Mainline operations on the SPRR in Madera County affect the cities of Madera and Chowchilla and the community of Fairmead. According to the SPRR yard master in Fresno, there are presently about 20 freight train operations per day in the Madera County area. Train speeds on the mainline are generally 45-65 mph, and train movements may occur at any time during the day or night. According to the Wyle methodology, the above described type and frequency of operation results in noise exposures of 65 and 60 dB L_{dn} at approximately 335 and 630 feet, respectively, from the center of the tracks. Noise levels in the vicinity of grade crossings are somewhat higher than this due to the use of the warning horn.

A branchline operation on the SPRR in Madera County occurs in the southwest part of the City of Madera. Operations on the branchline presently occur once a day. Train movements generally occur in the afternoon hours. Speeds are approximately 20 mph. According to the Wyle methodology, the 65 and 60 dB L_{dn} contours for this operation are inside the railroad right-of-way.

8.4 AIRPORTS

Airport noise was based on the county's *Airport Land Use Compatibility Plan*, prepared by the Madera Airport Land Use Commission and the City of Madera's *Municipal Airport Master Plan.*

CHOWCHILLA MUNICIPAL AIRPORT

The Chowchilla Municipal Airport serves single-engine and light, twin-engine propeller aircraft. A significant proportion of the operations by single-engine aircraft are by crop dusters. Noise-sensitive land uses potentially affected by noise from the airport are single-family homes east of Highway 99 and rural residential homes north of the airport. Noise contours for existing conditions at the airport have not been developed.

MADERA MUNICIPAL AIRPORT

The Madera Municipal Airport serves single- and twin-engine and twin-engine turboprop aircraft and, less frequently, turbojets and helicopters. Presently, there are two runways in a 7-25 and 12-30 configuration. A crop duster operation is based at the airport which uses runway 7-25 exclusively. Limited development has occurred to the southeast of the airport. However, between the airport and Highway 99, industrial, commercial and high-density residential development is planned. These developments could potentially be impacted by noise from aircraft operations at the airport. The existing (1990) 60 and 65 CNEL contours for the airport are shown on Figure 8-2. These contours are confined to public lands. However, noise from individual aircraft flights may be more intrusive at some locations around the airport than the annual noise exposure maps would suggest.

8.5 STATIONARY NOISE SOURCES

Production of noise is an inherent part of many industrial, commercial and agricultural processes, even when the best available noise control technology is applied. Noise production within an industrial, commercial or agricultural facility is controlled by federal and state employee health and safety regulations (OSHA and Cal-OSHA), but exterior noise emissions from such operations have a potential to exceed locally acceptable standards at noise-sensitive land uses.

From a land use planning perspective, industrial noise control issues focus upon two objectives: to prevent the introduction of new noise generating uses in a noise sensitive area, and to prevent encroachment of noise sensitive uses upon existing noise generating facilities. The first objective can be achieved by applying noise performance standards to proposed new noise generating uses. The second objective can be met by requiring that new noise-sensitive uses in proximity to existing noise generating facilities include mitigation measures to ensure compliance with noise performance standards.

The propagation of noise is dependent on atmospheric conditions. Atmospheric turbulence, temperature, humidity, and other conditions, which change from day to night and season to season, will result in noise level fluctuations. This phenomenon is most apparent at distances greater than a few hundred feet from a noise source. Since many noise-sensitive receiver locations in Madera County are ½ mile or more from noise sources, it is probable that noise level measurements conducted in different seasons and under different atmospheric conditions will produce different results.

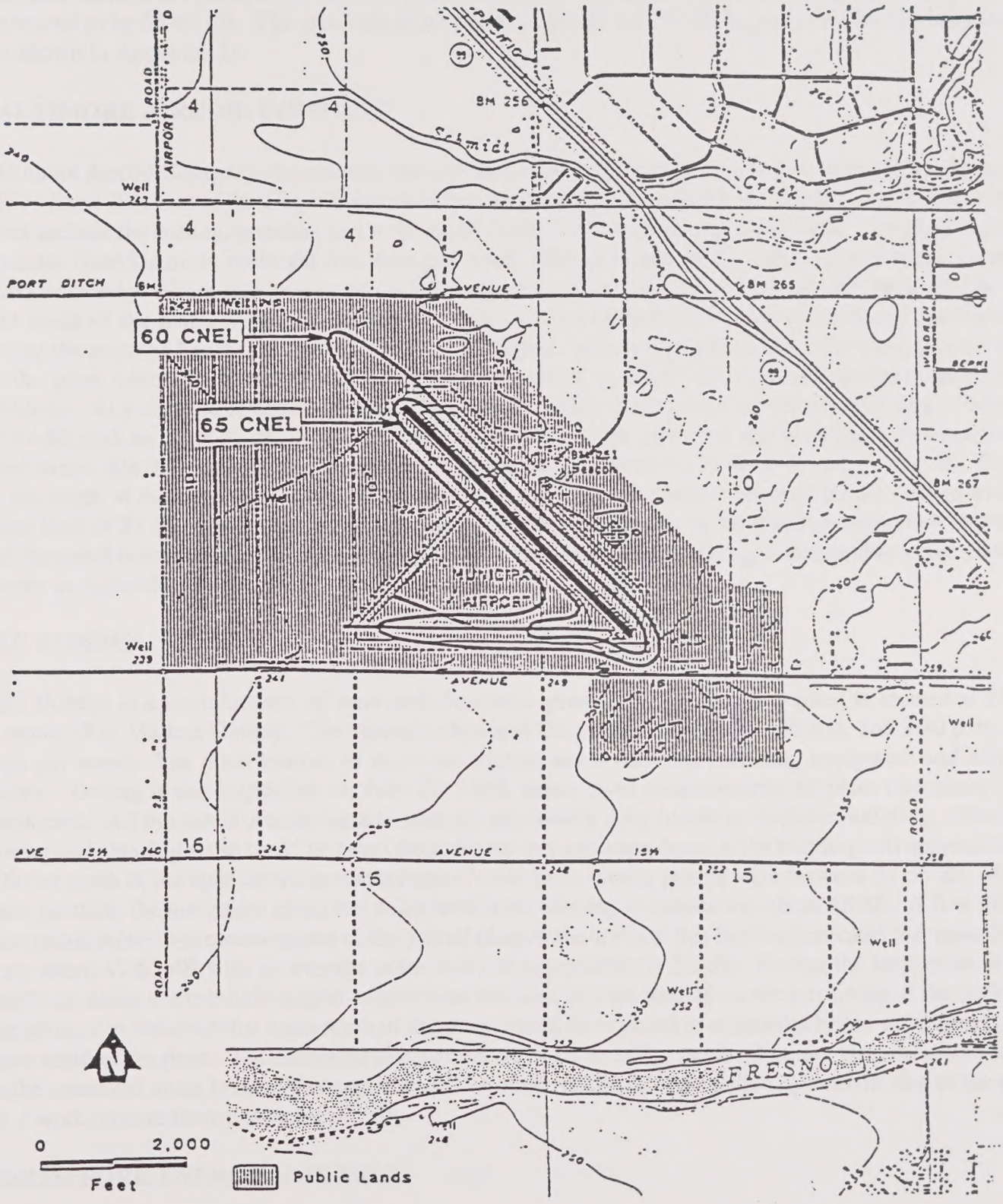
The following descriptions of existing industrial and other major noise sources in Madera County are intended to be representative of the relative noise impacts of such uses, and to identify specific noise sources which should be considered in the review of development proposals in their environs. The locations of these sources are shown in Figure 8-1.

HEUBLEIN WINERY

Heublein Winery is a wine manufacturing and distribution company located at 12667 Road 24 in Madera County. During the grape crushing season (middle of August to early October), operations occur on a 24 hour per day basis, six to seven days per week. For the remainder of the year, hours of operation at the winery are between 7 a.m. and 11 p.m., five days per week. Major sources of noise associated with the operation include boilers, vacuum pans, cooling towers, refrigeration equipment, delivery trucks and forklift machines. Bottling operations are enclosed within the buildings. Noise from delivery truck movements is mostly near the plant entrance on Road 24. Forklift machines mostly operate in the storage area and impact the areas to the west of the plant. Noise level measurements were conducted during the midday and early

FIGURE 8-2

Existing (1990) Noise Contours
Madera Municipal Airport



BBA

afternoon hours of July 28, 1993 at three locations around the plant facilities to document noise levels from typical operations. On the southwest side of the plant on Road 24, the main sources of noise were forklift trucks operating in the yard and storage area. Noise levels from the forklifts ranged between 56-58 dB. In the visitor parking area at an approximate distance of 400 feet from the wine processing building, noise levels from wine processing activities ranged between 55-57 dB. On Avenue 13 at a distance approximately one-half mile north of the plant, noise from the plant was barely distinguishable over background noise and was estimated to be 38-40 dB. The generalized locations of the 45 and 50 dB L_{eq} contours for the busy season are shown in Appendix D.

BALTIMORE AIRCOIL COMPANY

Baltimore Aircoil Company is a manufacturer of heat transfer equipment. The company plant is located at 15341 Road 28½ east of the City of Madera in Madera County. Principal noise sources associated with the plant include the cutting, grinding and welding of sheet metal, forklift trucks and fans. The plant typically operates from 7 a.m. to midnight five days per week. The peak season for the plant operations occurs in summer months. Noise-sensitive receivers in the vicinity of the operation are residences located to the west and south of the plant. Noise level measurements of plant operations were conducted at three locations during the morning hours of August 22, 1993. The highest noise impacts from the plant occur in areas north of the plant where sheet metal processing activities could be heard directly through openings in plant buildings. At a distance of approximately 200 feet north of the plant, measured noise levels ranged between 54-64 dB with an L_{eq} of 57 dB. The maximum noise levels in this area were due to grinding and banging of sheet metal. On the west side of the plant, noise levels were between 48-54 dB with an L_{eq} of 51 dB. Farther to the south, at the southwest corner of the facilities, noise levels were between 48-53 dB with an average noise level of 51 dB. The estimated noise exposure in terms of L_{eq} due to the plant was calculated based on the measured noise levels. The approximate locations of the 45 and 50 dB L_{eq} contours due to the plant are shown in Appendix D.

IKG BORDEN

IKG Borden is a manufacturer of steel and aluminum gratings. The company plant is located at 31266 Avenue 12 in Madera County. The operation hours at the plant are between 7:00 a.m. and 3:30 p.m., five days per week. The main sources of noise are friction saws, hammers, welding equipment and delivery trucks. During a site inspection on July 22, 1993, noise level measurements of plant operations were conducted. All the metal processing activities are apparently done inside an enclosed building. However, sawing and clanking noise could be heard distinctively through open doors in the building. At approximately 200 feet north of the open doors, measured noise levels from sawing metals were between 51-55 dB. At the same location, the maximum measured noise level from banging of metals was about 48 dB. A five-minute continuous noise level measurement of the overall plant noise levels at this location indicated that noise levels were about 47-55 dB with an average noise level of approximately 50 dB. During the inspection, it was noted that doors in the building open to both west and east and are located on the north side of the building. Therefore, it is believed that areas north of the plant would be exposed to somewhat higher noise levels than those south of the plant. The estimated noise exposure in terms of L_{eq} due to the plant was calculated based on the measured noise levels. The approximate locations of the 45 and 50 dB L_{eq} contours due to the plant for a work day are shown in Appendix D.

NORTH FORK ENERGY/SAW MILL

North Fork Energy is a combined operation of a cogeneration plant and a saw mill. The company plant is located on Road 225 approximately one-third of a mile east of North Fork Road in Madera County. The saw

mill operates in processing and milling of lumber. The waste from the saw mill is burnt at the cogeneration plant to produce steam for energy purposes. Part of the steam produced at the cogeneration plant is used at the saw mill and the excess is sold to the Pacific Gas and Electric Company. The company operates on a 24 hour per day basis seven days a week. Noise producing equipment at the plant include a loader, generator, hammers, saws, log stackers, and trucks. Nearly all equipment, except the loader, are operated in enclosed buildings. During a site inspection of the facilities conducted on June 1, 1993, noise levels from the plant were measured at different nearby locations. At the nearest residence to the plant (approximately 200 yards southwest of the plant), the noise levels from the plant ranged between 48-51 dB with an average noise level of 49 dB. At the North Fork Union School, noise levels from the operation ranged between 40-48 dB with an average noise level of 45 dB. On Road 225 at approximately 500 yards from the mill, the dominant noise source was the generator. Measured noise levels at this location were about 44-47 dB with an L_{eq} of 45 dB. On Road 225 directly across the street from the mill, the noise was mostly due to stacking logs. Measured noise levels at this location were about 47-53 dB with an L_{eq} of 50 dB. At North Fork Recreation Center, about 100 yards west of the cogeneration plant, measured noise levels from the plant were between 45-62 dB with an L_{eq} of about 49 dB. At the house next to the refuse transfer station, approximately one-half mile northwest of the saw mill on Road 274, the measured L_{eq} was about 42 dB. The approximate locations of the 45 and 50 dB L_{eq} contours due to the plant are shown in Appendix D.

RAYMOND GRANITE COMPANY

The Raymond Granite Company removes and processes granite for use as counter tops, monuments, surface-mounting slabs, etc. The quarry operation is located approximately in the center of a 4,000-acre parcel owned by the plant operators. For this reason, the closest residential or other noise-sensitive land uses not owned by the plant operators are located about one-half mile west of the quarry site. Normal hours of operation are 6:00 a.m. to 3:30 p.m. during the summer and 7:00 a.m. to 4:30 p.m. during the winter, five days per week. Operating hours may be extended if warranted by product demand.

Major sources of noise associated with the quarry operation include rock drills, pneumatic hammers, front loaders, a derrick and a generator. Blasting occurs one to ten times per day to loosen granite blocks from the parent rock, and a quarry burner is used to trench the rock on either side of the block to be removed. The burner is generally used at night after normal quarry operating hours.

The plant includes shot saws, wire saws, compressors and equipment used for polishing rock. Nearly all equipment associated with the plant is enclosed within buildings. Mobile sources of noise in the plant area include large trucks and loaders.

Noise measurements were conducted during a site inspection on June 2, 1993. The noise levels measured on-site are reported by Table 8-2. At the intersection of Roads 606 and 411 (homes in this area are owned by the plant operators), noise levels from the quarry and plant were about 30-35 dBA at 11:00 a.m. Such levels were faintly audible above other sources of background noise such as wind in the trees and singing birds. At this same location, the maximum noise level was 68 dBA (determined using "fast" meter response) from a blast (light charge) at 2:45 p.m. on June 2, 1993. Blasting is preceded by three horn blasts to warn workers and other people in the surrounding area. The noise level from these horn blasts was about 55 dBA at the above-described measurement location. Blasting occurs only during the daytime hours. At approximately 8:00 p.m. on June 2, 1993, measured noise levels from the quarry burner ranged from 32-48 dBA depending on atmospheric conditions and the movement of the burner nozzles within the rock.

Although noise levels from blasting and from the nighttime use of the quarry burner were clearly audible at the intersection of Roads 606 and 411, noise levels at the nearest homes not owned by the plant operators

would not be expected to exceed the noise level standards of the Noise Element. However, due to the rural nature of the area, and the resulting low background noise levels, noise complaints could occur if development of new noise-sensitive land uses were to occur in the area.

TABLE 8-2

ON-SITE NOISE MEASUREMENT DATA
RAYMOND GRANITE COMPANY

Equipment	Measurement Distance	Noise Level, dBA Range (L_{eq})
Clark 475B front loader	65'	80-85(82.3)
S-58 pneumatic hammer	125'	75
Double-hammer drill guide	50'	85-87(85.8)
Portable generator (440V.)	50'	73-74(73.6)
Breton shot saw	75'	66-68
Patch-Wagner 18" circular saw	25'	87-90(87.6)
Mini-flex hammer drill (tractor-mounted)[1]	---	---
Wire saw[2]	---	---

[1] Not in use, but reported to be less noisy than the double-hammer drill guide or S-58 pneumatic hammer.
[2] Not is use, but reported to be less noisy than shot saw.

Source: Brown-Buntin Associates, Inc., 1993

8.6 COMMUNITY NOISE SURVEY

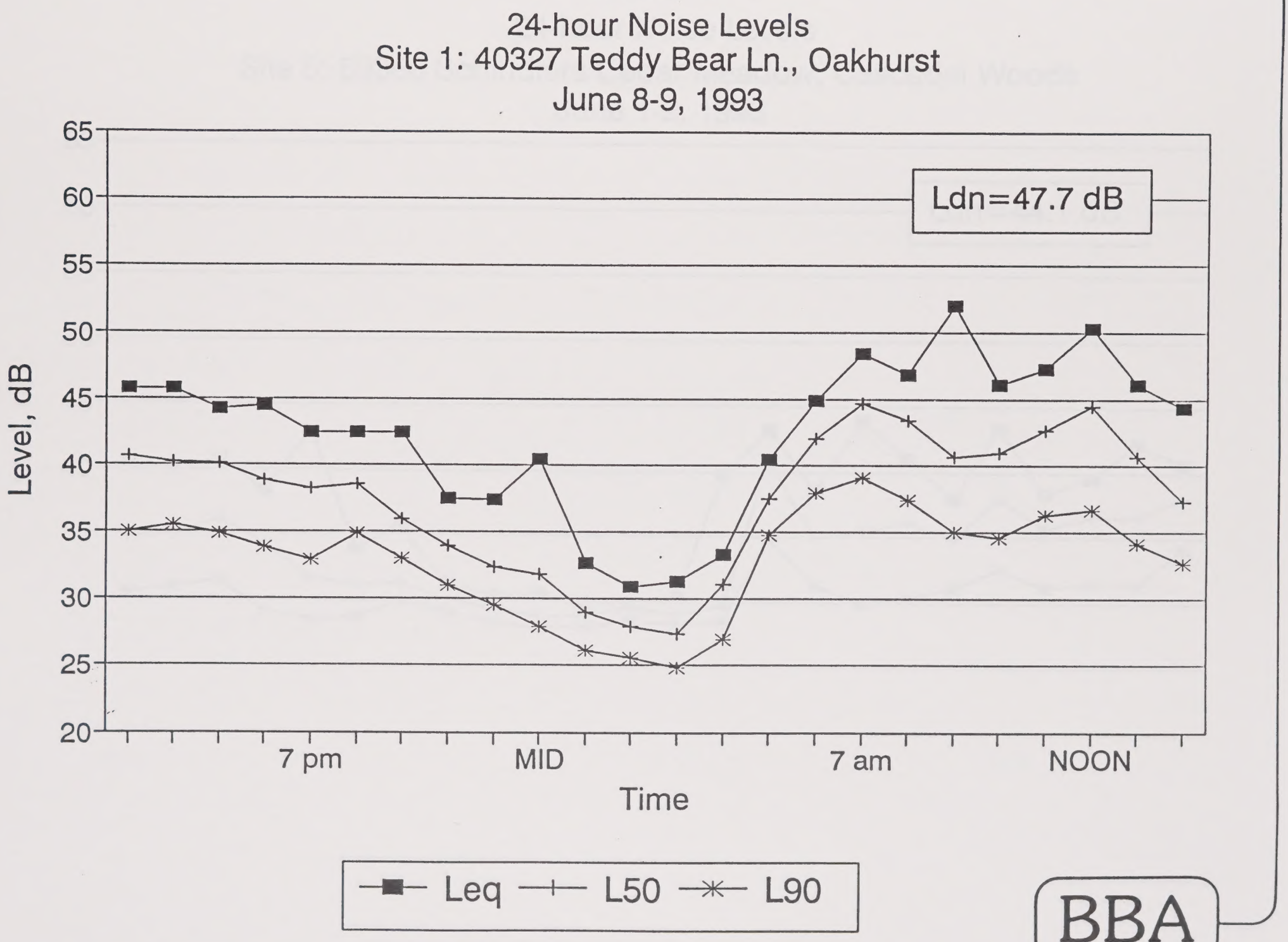
A community noise survey was conducted to document noise exposure in areas of the county containing noise-sensitive land uses. These areas were selected by the Madera County Planning Department staff. A total of 20 monitoring sites were chosen as shown by Figure 8-1. A combination of short-term and continuous noise monitoring was used to document existing noise levels at these locations. Noise monitoring equipment used for short-term monitoring consisted of Bruel & Kjaer (B&K) Type 2218 and 2230 precision sound level meters equipped with Type 4165 and 4155 ½" microphones, respectively. Equipment used for continuous monitoring consisted of Larson-Davis Laboratories Model 820 environmental noise monitors equipped with B&K Type 4176 ½" microphones. All measurement equipment comply with applicable requirements of the American National Standards Institute (ANSI) for Type I sound level meters.

During the short term monitoring programs, noise levels were measured for approximately 15 minutes during each of the two periods of the day and 5 minutes during the night so that reasonable estimates of L_{dn} at the monitoring sites could be predicted.

The data collected during the short-term sampling program included the average noise level (L_{eq}), maximum noise level (L_{max}), minimum noise level (L_{min}) and a description of major sources of noise which were audible at the monitoring sites. Continuous noise monitoring was conducted at 4 out of the 20 community noise survey sites to document fluctuations in noise levels over a typical 24-hour period. Noise level data collected during continuous monitoring included the hourly L_{eq} and L_{max} and the statistical distribution of noise levels over each hourly sample period. The measurement results at the sites where continuous noise monitoring was conducted are shown in Figures 8-3 through 8-6. Overall community noise survey results are summarized in Table 8-3.

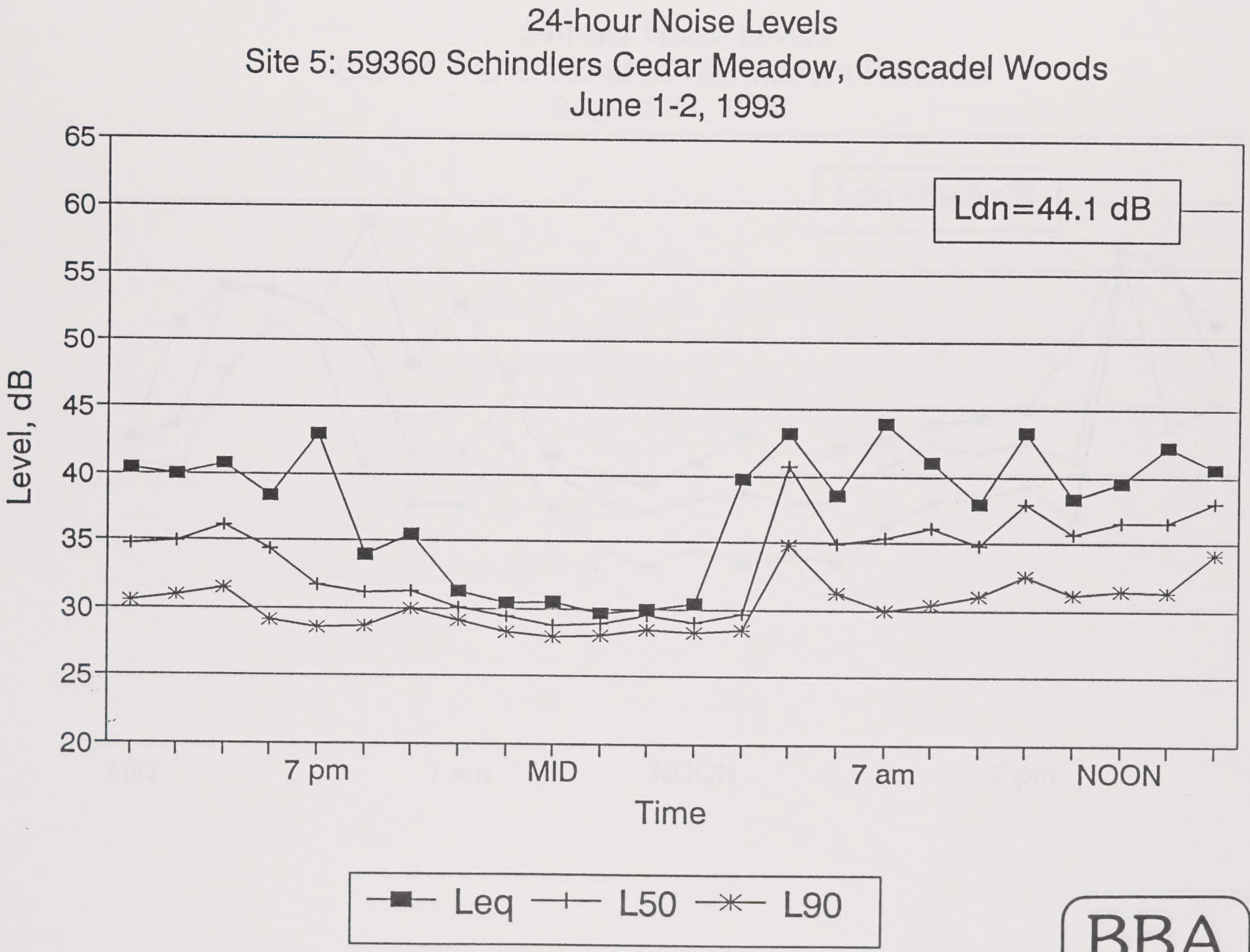
The community noise survey results indicate that typical noise levels in noise-sensitive areas of the unincorporated areas of Madera County are in the range of 41-63 dB L_{dn}. As would be expected, the quietest areas are those which are removed from major transportation-related noise sources and local industrial or other stationary noise sources.

FIGURE 8-3



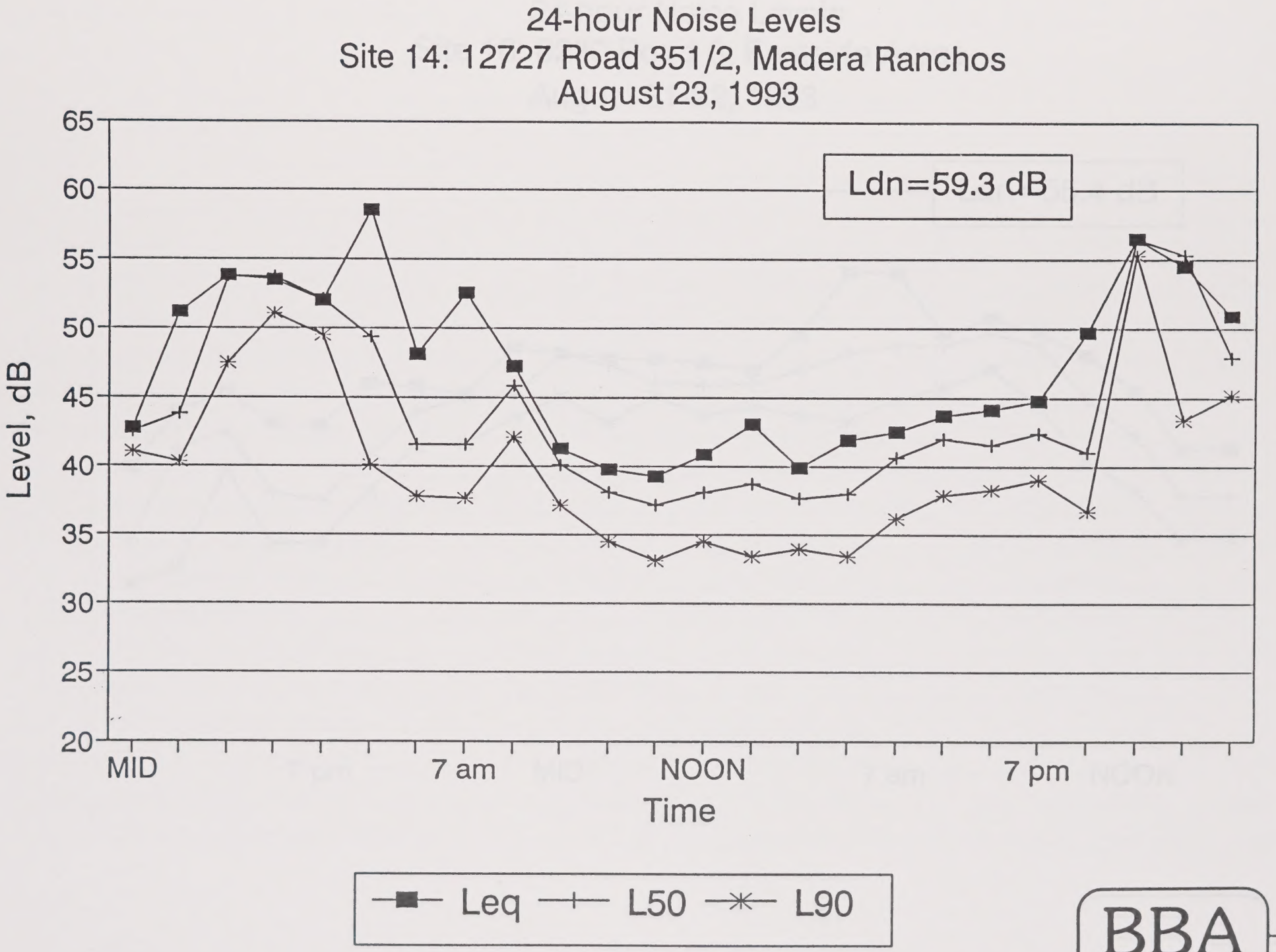
BBA

FIGURE 8-4



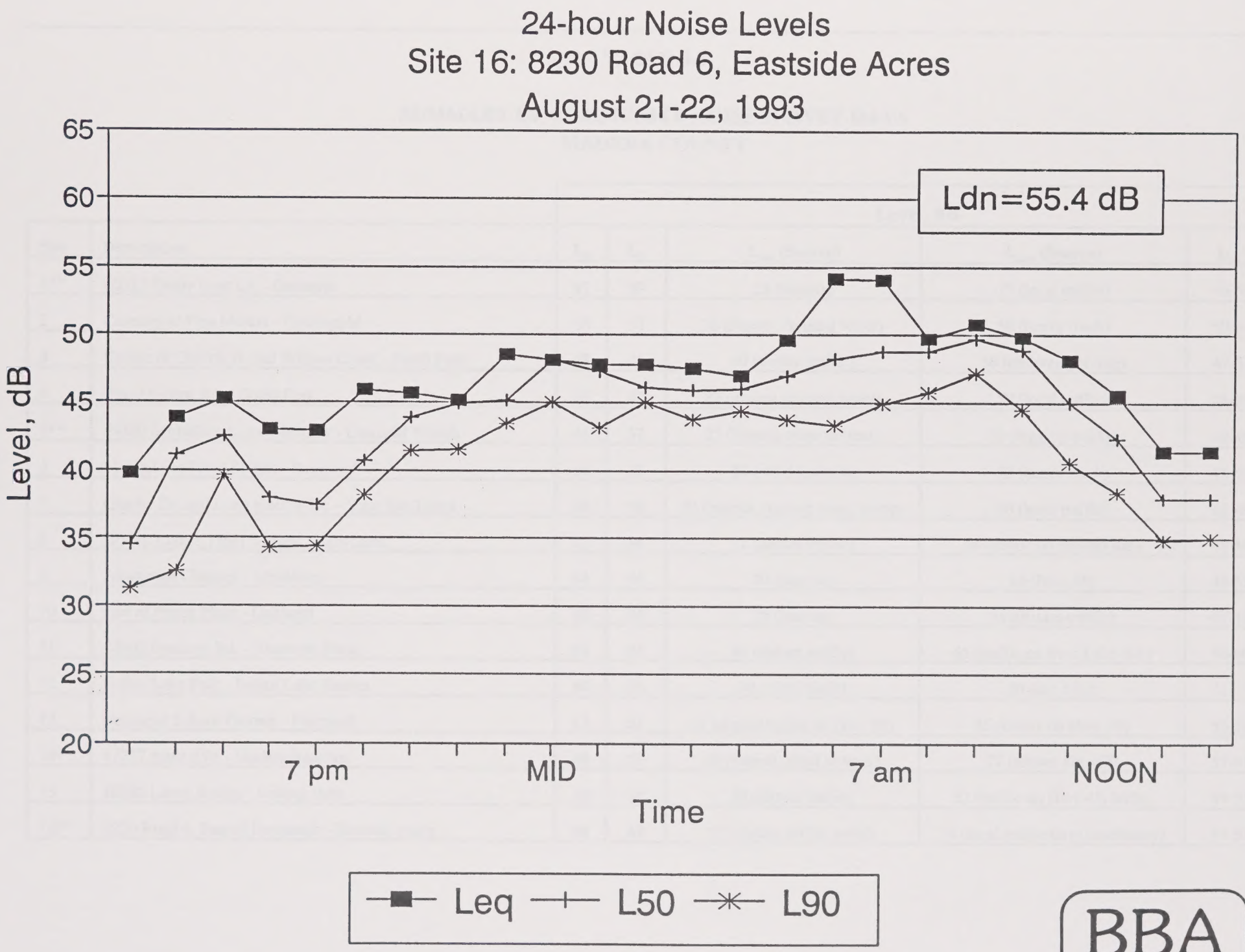
BBA

FIGURE 8-5



BBA

FIGURE 8-6



BBA

TABLE 8-3

SUMMARY OF COMMUNITY NOISE SURVEY DATA
MADERA COUNTY

Site	Description	Level, dB				
		L_D	L_N	L_{min} (Source)	L_{max} (Source)	L_{dn}*
1**	40327 Teddy Bear Ln. - Oakhurst	47	39	23 (insects)	77 (local traffic)	46-50
2	Coarsegold Flea Market - Coarsegold	58	53	36 (insects, running water)	66 (heavy truck)	59-63
3	Corner of Church St. and Willow Creek - North Fork	48	41	40 (distant traffic)	56 (children playing)	47-51
4	Poy-Ah-Now Rd. - South Fork	40	42	32 (distant running water)	59 (local traffic)	46-50
5**	59360 Schindlers Cedar Meadow - Cascadel Woods	41	37	25 (insects, wind in trees)	70 (logging trucks)	42-46
6	Merced and Front Streets - Raymond	50	30	27 (wind in trees)	72 (heavy truck)	46-50
7	Glacier Dr. and Long Hollow Dr. - Yosemite Lakes	46	36	32 (insects, barking dogs, pump)	60 (local traffic)	44-48
8	Hilltop Lodge, Pines Village - Bass Lake	42	36	32 (distant traffic)	58 (traffic on Hilltop Rd.)	42-46
9	Ahwahnee Chappel - Ahwahnee	44	44	29 (insects)	60 (Hwy 49)	48-52
10	End of Pierce Place - Oakhurst	40	36	29 (insects)	54 (distant traffic)	41-45
11	42463 Buckeye Rd. - Yosemite Forks	52	52	46 (distant traffic)	65 (traffic on Bass Lake Rd.)	56-60
12	Indian Lake Park - Indian Lake Estates	40	35	30 (wind, birds)	50 (dirt bike)	41-45
13	Fairmead School Parking - Fairmead	47	51	44 (distant traffic on Hwy 99)	55 (trucks on Hwy 99)	55-59
14**	12727 Road 35½ - Madera Ranchos	48	53	29 (insects, wind in trees)	77 (distant aircraft)	57-61
15	10222 Lanes Bridge - Rolling Hills	45	44	38 (distant traffic)	52 (traffic on Hwy 41, birds)	49-53
16**	8230 Road 6, East of Firebaugh - Eastside Acres	48	49	27 (distant traffic, wind)	74 (local traffic/farm machinery)	53-57

TABLE 8-3 (Continued)

SUMMARY OF COMMUNITY NOISE SURVEY DATA
MADERA COUNTY

		Level, dB				
Site	**Description**	**L_D**	**L_N**	**L_{min} (Source)**	**L_{max} (Source)**	**L_{dn}***
17	End of Riverview Ct. - Goldside Estates	39	41	33 (insects)	49 (birds, insects, dist. traffic)	45-49
18	27242 Perkins Rd., south of Madera city limits - Parkwood	49	48	42 (distant traffic on Hwy 99)	55 (trucks on S.R. 145)	53-57
19	17470 Melba Dr. - Madera Acres	42	43	39 (distant traffic on Hwy 99)	47 (distant traffic on Hwy 99)	47-51
20	13339 Cronin - Borden	44	44	41 (distant traffic on Hwy 99)	48 (roosters, dogs barking)	48-52

L_D: Average L_{eq} of two 15-minute samples obtained between 7:00 am and 10:00 pm except for sites marked with a ** where 24-hour monitoring was conducted.

L_N: L_{eq} for one 15-minute sample obtained between 10:00 pm and 7:00 am except for sites marked with a ** where 24-hour monitoring was conducted.

* Estimated range of L_{dn} based on three 15-minute samples.

** 24-hour monitoring site

Source: Brown-Buntin Associates, Inc.

8.7 FINDINGS

- Roadway traffic is a major source of noise in Madera County, primarily from traffic State highways and major County roadways.

- Railroads are a major source of noise in Madera County. The Atchison, Topeka and Santa Fe (AT & SF) mainline railway affects scattered residences in rural areas near the tracks, while the Southern Pacific (SP) mainline operations affect the cities of Madera and Chowchilla and the community of Fairmead.

- The Madera and Chowchilla Municipal Airports are significant sources of noise in Madera County. Noise-sensitive land uses potentially affected by noise from the Chowchilla airport are single-family homes east of Highway 99 and rural residential homes north of the airport. Land uses potentially affected by the Madera airport include planned industrial, commercial and high-density residential development between Highway 99 and the airport.

- Industrial uses, saw mills, energy generation plants, and mining operations are significant noise sources in Madera County. In some cases, noise-sensitive land uses are located near these operations. In most cases, however, noise generators are located in areas containing only industrial uses, or in rural areas surrounded by a significant amount of open space or agriculture.

- Typical noise levels in noise-sensitive areas of the unincorporated areas of Madera County are in the range of 41-63 dB L_{dn}. The quietest areas are those which are removed from major transportation-related noise sources and local industrial or other stationary noise sources.

8.8 PERSONS CONSULTED

Abts, Jerry, Controller, Heublein Wines, Madera

Boyd, David, Plant Manager, Baltimore Aircoil Company, Madera

Chief Dispatcher, Santa Fe Railway, Fresno

Garoupa, Leonard, Planning Director, Madera County

Knapp, Richard D., Raymond Granite Company, Raymond

Mansfield, John, Raymond Granite Company, Raymond

Vander Veur, Mike, Superintendent, North Fork Energy, North Fork

Williams, Ron, Maintenance Supervisor, IKG Borden, Madera

Yard Master's Office, Southern Pacific Railroad, Fresno

8.9 BIBLIOGRAPHY

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Madera County Transportation Commission, *Traffic Volumes*, 1991

8.10 GLOSSARY

Ambient Noise Level: The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

CNEL: Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

Decibel, dB: A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the reference pressure, which is 20 micropascals (20 micronewtons per square meter).

L_{dn}: Day-Night Average Sound Level. The average equivalent sound level during a 24-hour day obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

L_{eq}: Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computer over 1, 8, and 24-hour sample periods.

> **Note:** CNEL and L_{dn} represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.

L_{max}: The maximum sound level recorded during a noise event.

L_n: The sound level exceeded "n" percent of the time during a sample interval. L_{10} equals the level exceeded 10 percent of the time (L_{90}, L_{50}, etc.).

Noise Exposure Contours: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and L_{dn} contours are frequently utilized to describe community exposure to noise.

SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure level for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

APPENDICES

APPENDIX A

CITY OF MADERA PARKS INVENTORY

PARKS INVENTORY

Lion Town and Country Park
Location: Between Howard Road, Schnoor Street, Industrial Avenue, and Granada Drive
Approximate Area: 50 acres
Existing Facilities:

- Two volleyball courts
- Two horseshoe pits
- Playground
- Senior Citizen Picnic Area (small group area - 50)
- Barbecue grills, picnic tables
- Two Little League lighted baseball fields, concession stand, restrooms
- Multi-use sports field with 3 lighted softball fields, 1 lighted Little League field, restroom
- Lake and canal system
- Amphitheater with concession area, dressing rooms
- Security mobile home
- Covered pavilion area with large barbecue, enclosed kitchen with sink, running water, refrigerator, and restrooms
- Walking paths
- Batting range (privately operated)
- Five (5) individual picnic areas with tables and barbecues
- Shop
- Parking facilities

Rotary Park
Location: North of the Fresno River, between Gateway Drive and Freeway 99
Approximate Area: 11.9 acres
Existing Facilities:

- Playground equipment
- One softball field (recreational)
- One sand volleyball court
- One soccer field
- Picnic pavilion (fenced) with 200 tables, large barbecue grill, restrooms, and 5 picnic shelters with tables and barbecues
- Restrooms
- Water fountains
- Parking facilities

Pan Am Park

Location: Northwest corner of Sherwood Way and North Lake Street
Approximate Area: 4 acres
Existing Facilities:

- Playground equipment
- Covered pavilion with tables, barbecue
- Restrooms
- Large playing field
- Trash containers
- Trees planted along perimeter of park
- Two benches

Riverside Parkstrip

Location: North bank of Fresno River, South of Riverside Drive between North D Street and North Lake Street
Approximate Area: 2 acres
Existing Facilities: Landscaped parkstrip

Riverview Park

Location: South bank of Fresno River, West of Freeway 99 and North of Riverview Drive
Approximate Area: 1 acre
Existing Facilities:

- Landscaped parkstrip
- Play equipment at end of Lillian Way
- One picnic table/bench

Swim Pool Park

Location: Between Flume, East 5th Street, High Street, and the Fresno River
Approximate Area: 3.9 acres
Existing Facilities:

- Playground equipment
- Swimming pool complex with bleachers
- Fences tennis courts (two courts)
- Restrooms
- Benches

Millview Park

Location: Southwest corner of Avenue 15 1/2 and Road 26, adjacent to the Madera Community Center
Approximate Area: 5.5 acres
Existing Facilities:

- Playground
- Individual picnic area (3) with table and barbecue
- Light for softball field
- Athletic fields (current use) - one large soccer field, two small soccer fields, one softball field
- Community Center Complex

McNally Park

Location: Between South Lake Street, Roosevelt Street, South A Street, and East 12th Street
Approximate Area: 2/3 acres
Existing Facilities:

- Playground equipment
- Covered pavilion with tables and barbecue
- Restrooms
- Basketball courts (two)
- Volleyball court (grass)
- Tetherball standards (2)
- Individual picnic facilities
- Benches

Knox Park

Location: Drainage basin at northeast corner of East A Street and Knox Avenue
Approximate Area: 2.1 acres
Existing Facilities:
Playground
Soccer field with goals

APPENDIX B

CALIFORNIA DEPARTMENT OF FISH AND GAME WILDLIFE HABITAT RELATIONSHIP SYSTEM

LOCATION: MADERA COUNTY

ID	SPECIES NAME	SCIENTIFIC NAME	STATUS	WHR HABITATS (see key at end of appendix A)																										
				VALLEY FLOOR									FOOTHILL						MOUNTAINS											
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
A001	CALIFORNIA TIGER SALAMANDER	*Ambystoma californiense*	Yearlong				X			X			X	X			X													
A007	CALIFORNIA NEWT	*Taricha torosa*	Yearlong				X					X	X	X		X				X	X			X					X		
A012	ENSATINA	*Ensatina eschscholtzi*	Yearlong											X	X	X			X	X	X	X		X					X		
A015	BLACK-BELLIED SLENDER SALAMANDER	*Batrachoseps nigriventris*	Yearlong											X	X	X							X								
A016	PACIFIC SLENDER SALAMANDER	*Batrachoseps pacificus*	Yearlong										X	X	X	X			X	X	X	X	X	X							
A022	ARBOREAL SALAMANDER	*Ancides lugubris*	Yearlong											X	X	X								X							
A023	MOUNT LYELL SALAMANDER	*Hydramantes platycephalus*	Yearlong																					X	X	X	X	X			
A028	WESTERN SPADEFOOT	*Scaphiopus hammondi*	Yearlong		X			X					X	X		X															
A032	WESTERN TOAD	*Bufo boreas*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X			X	X	X
A033	YOSEMITE TOAD	*Bufo canorus*	Yearlong																						X		X	X	X		X
A039	PACIFIC TREEFROG	*Hyla regilla*	Yearlong	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
A040	RED-LEGGED FROG	*Rana aurora*	Yearlong				X				X								X												
A043	FOOTHILL YELLOW-LEGGED FROG	*Rana boylei*	Yearlong				X				X			X	X	X			X					X					X	X	
A044	MOUNTAIN YELLOW-LEGGED FROG	*Rana muscosa*	Yearlong																		X	X	X			X		X		X	X	X
A046	BULLFROG	*Rana catesbeiana*	Yearlong	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X				X		X					X	X
B003	COMMON LOON	*Gavia immer*	Winter															X													X
B006	PIED-BILLED GREBE	*Podilymbus podiceps*	Yearlong							X	X	X						X	X											X	X
B007	HORNED GREBE	*Podiceps auritus*	Fall-Winter							X								X													
B009	EARED GREBE	*Podiceps nigricollis*	Fall-Winter							X	X	X						X	X												
B010	WESTERN GREBE	*Aechmophorus occidentalis*	Fall-Winter							X	X	X						X	X												
	CLARK'S GREBE	*Aechmophorus clarkii*	Fall-Winter							X	X	X						X	X												
B042	AMERICAN WHITE PELICAN	*Pelecanus erythrorhynchos*	Fall-Winter							X								X													
B044	DOUBLE-CRESTED CORMORANT	*Phalacrocorax auritus*	Fall-Winter							X	X	X						X	X											X	X
B049	AMERICAN BITTERN	*Botaurus lentiginosus*	Yearlong							X	X	X						X	X												
B050	LEAST BITTERN	*Ixobrychus exilis*	Spring-Summer							X	X	X						X	X												
B051	GREAT BLUE HERON	*Ardea herodias*	Yearlong	X		X	X			X	X	X	X	X	X			X	X	X	X	X	X		X					X	X
B052	GREAT EGRET	*Casmerodius albus*	Yearlong	X		X	X			X	X	X	X	X	X			X	X			X									
B053	SNOWY EGRET	*Egretta thula*	Yearlong	X		X	X			X	X	X						X	X			X									
B057	CATTLE EGRET	*Bubulcus ibis*	Yearlong	X		X	X			X	X	X	X	X	X			X	X												
B058	GREEN-BACKED HERON	*Butorides striatus*	Yearlong		X		X			X	X	X		X	X			X	X	X	X		X		X						
B059	BLACK-CROWNED NIGHT HERON	*Nycticorax nycticorax*	Yearlong				X		X	X	X	X		X	X	X	X	X	X	X	X	X		X							
B062	WHITE-FACED IBIS	*Plegadis chihi*	Yearlong	X		X				X	X	X	X					X	X												
B065	FULVOUS WHISTLING DUCK	*Dendrocygna bicolor*	Spring-Summer	X		X						X																			
B067	TUNDRA SWAN	*Cygnus columbianus*	Fall-Winter	X		X				X	X	X	X					X	X												
B070	GREATER WHITE-FRONTED GOOSE	*Anser albifrons*	Fall-Winter	X		X				X	X	X	X					X	X												
B071	SNOW GOOSE	*Chen caerulescens*	Fall-Winter	X		X				X	X	X	X					X	X												
B072	ROSS'S GOOSE	*Chen rossii*	Fall-Winter	X		X				X	X	X	X					X	X												
B073	CANADA GOOSE	*Branta canadensis*	Fall-Winter	X		X			X	X	X	X	X					X	X												
B076	WOOD DUCK	*Aix sponsa*	Yearlong	X			X		X	X	X	X		X	X			X	X	X	X	X		X	X	X				X	X

				VALLEY FLOOR									FOOTHILL						MOUNTAINS											
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B077	GREEN-WINGED TEAL	*Anas crecca*	Fall-Winter	X		X			X	X	X	X	X				X	X			X									
B079	MALLARD	*Anas platyrhynchos*	Yearlong	X		X	X		X	X	X	X	X				X	X			X							X	X	X
B080	NORTHERN PINTAIL	*Anas acuta*	Fall-Winter	X		X			X	X	X	X	X				X	X												
B082	BLUE-WINGED TEAL	*Anas discors*	Fall-Winter	X		X				X		X	X				X													
B083	CINNAMON TEAL	*Anas cyanoptera*	Yearlong	X		X				X	X	X	X				X	X												
B084	NORTHERN SHOVELOR	*Anas clypeata*	Yearlong	X		X				X		X	X				X													
B085	GADWALL	*Anas strepera*	Yearlong	X		X				X		X	X				X													
B086	EURASIAN WIGEON	*Anas penelope*	Winter				X		X			X	X																	
B087	AMERICAN WIGEON	*Anas americana*	Fall-Winter	X		X			X	X	X	X	X				X	X												
B089	CANVASBACK	*Aythya valisineria*	Fall-Winter							X	X	X					X	X											X	X
B090	REDHEAD	*Aythya americana*	Yearlong							X		X					X													X
B091	RING-NECKED DUCK	*Aythya collaris*	Fall-Winter							X		X					X											X		X
B094	LESSER SCAUP	*Aythya affinis*	Fall-Winter	X		X				X		X	X				X											X		X
B101	COMMON GOLDENEYE	*Bucephala clangula*	Fall-Winter							X	X						X	X											X	X
B102	BARROW'S GOLDENEYE	*Bucephela islandica*	Winter														X	X											X	X
B103	BUFFLEHEAD	*Bucephala albeola*	Fall-Winter							X		X					X				X				X	X				X
B104	HOODED MERGANSER	*Lophodytes cucullatus*	Winter				X		X			X									X									
B105	COMMON MERGANSER	*Mergus merganser*	Yearlong				X		X	X	X	X					X	X			X							X	X	X
B107	RUDDY DUCK	*Oxyura jamaicensis*	Yearlong							X		X					X													
B108	TURKEY VULTURE	*Cathartes aura*	Yearlong	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
B110	OSPREY	*Pandion haliaetus*	Fall-Spring							X	X						X	X											X	X
B111	BLACK-SHOULDERED KITE	*Elanus caeruleus*	Yearlong	X	X	X	X	X	X			X	X	X	X	X														
B113	BALD EAGLE	*Haliaeetus leucocephalus*	Winter				X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
B114	NORTHERN HARRIER	*Circus cyaneus*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
B115	SHARP-SHINNED HAWK	*Accipiter striatus*	Yearlong	X	X	X	X		X				X	X	X	X			X	X	X	X	X	X	X	X	X		X		
B116	COOPER'S HAWK	*Accipiter cooperii*	Yearlong	X	X	X	X		X				X	X	X	X			X	X	X	X	X	X	X	X					
B117	NORTHERN GOSHAWK	*Accipiter gentilis*	Yearlong											X	X				X	X	X	X	X	X	X	X	X				
B119	RED-SHOULDERED HAWK	*Buteo lineatus*	Yearlong	X	X	X	X		X			X	X	X	X																
B121	SWAINSON'S HAWK	*Buteo swainsoni*	Spring-Summer	X	X	X	X	X	X				X	X																	
B123	RED-TAILED HAWK	*Buteo jamaicensis*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X		X	X		
B124	FERRUGINOUS HAWK	*Buteo regalis*	Winter	X	X	X	X	X	X			X	X	X	X																
B125	ROUGH-LEGGED HAWK	*Buteo lagopus*	Winter	X	X	X	X					X	X	X	X																
B126	GOLDEN EAGLE	*Aquila chrysaetos*	Yearlong			X	X	X					X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
B127	AMERICAN KESTREL	*Falco sparverius*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
B128	MERLIN	*Falco columbarius*	Winter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X
B129	PEREGRINE FALCON	*Falco peregrinus*	Yearlong				X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
B131	PRAIRIE FALCON	*Falco mexicanus*	Yearlong			X	X	X				X	X	X	X	X			X	X	X	X	X	X	X	X	X		X		
B133	RING-NECKED PHEASANT	*Phasianus colchicus*	Yearlong	X	X	X	X		X				X																		
B134	BLUE GROUSE	*Dendragapus obscurus*	Yearlong																X	X	X	X		X	X	X	X	X			
B135	WHITE-TAILED PTARMIGAN	*Lagopus leucurus*	Yearlong																						X		X	X			
B138	TURKEY	*Meleagris gallopavo*	Yearlong	X		X	X						X	X	X	X			X	X	X	X	X	X					X		
B140	CALIFORNIA QUAIL	*Callipepla californica*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X					X		
B141	MOUNTAIN QUAIL	*Oreortyx pictus*	Yearlong												X	X			X	X	X	X	X	X	X	X	X		X		

				VALLEY FLOOR									FOOTHILL						MOUNTAINS											
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B145	VIRGINIA RAIL	*Rallus limicola*	Yearlong				X					X									X									
B146	SORA	*Porzana carolina*	Yearlong									X																		
B148	COMMON MOORHEN	*Gallinula chloropus*	Yearlong						X	X	X	X					X	X												
B149	AMERICAN COOT	*Fulica americana*	Yearlong	X		X			X	X	X	X	X				X	X												
B150	SANDHILL CRANE	*Grus canadensis*	Fall–Winter	X		X				X		X	X				X													
B151	BLACK-BELLIED PLOVER	*Pluvialis squatarola*	Fall–Spring	X		X				X	X	X	X				X	X												
B156	SEMIPALMATED PLOVER	*Charadrius semipalmatus*	Fall–Spring																											
B158	KILLDEER	*Charadrius vociferus*	Yearlong	X		X		X	X	X	X	X	X				X	X										X	X	X
B159	MOUNTAIN PLOVER	*Charadrius montanus*	Winter	X		X							X																	
B163	BLACK-NECKED STILT	*Himantopus mexicanus*	Yearlong	X		X				X	X	X					X	X												
B164	AMERICAN AVOCET	*Recurvirostra americana*	Yearlong	X		X				X	X	X					X	X												
B165	GREATER YELLOWLEGS	*Tringa melanoleuca*	Fall–Spring							X	X	X					X	X												
B166	LESSER YELLOWLEGS	*Tringa flavipes*	Fall–Spring							X	X	X					X	X												
B168	WILLET	*Catoptrophorus semipalmatus*	Fall–Winter	X		X				X	X	X	X				X	X												
B170	SPOTTED SANDPIPER	*Actitis macularia*	Yearlong							X	X	X	X				X	X										X	X	X
B172	WHIMBREL	*Numenius phaeopus*	Spring	X		X				X	X	X	X				X	X												
B173	LONG-BILLED CURLEW	*Numenius americanus*	Fall–Spring	X		X				X	X	X	X				X	X												
B183	WESTERN SANDPIPER	*Calidris mauri*	Yearlong	X		X				X	X	X					X	X												
B185	LEAST SANDPIPER	*Calidris minutilla*	Fall–Spring			X				X	X	X					X	X												
B191	DUNLIN	*Calidris alpina*	Fall–Spring	X		X				X	X	X					X	X												
B197	LONG-BILLED DOWITCHER	*Limnodromus scolopaceus*	Fall–Spring	X		X				X	X	X					X	X												
B199	COMMON SNIPE	*Gallinago gallinago*	Fall–Spring	X		X				X	X	X					X	X										X	X	X
B200	WILSON'S PHALAROPE	*Phalaropus tricolor*	Spring–Fall					X		X	X	X	X				X	X										X	X	X
B211	BONAPARTE'S GULL	*Larus philadelphia*	Spring–Fall							X	X						X	X												
B214	RING-BILLED GULL	*Larus delawarensis*	Yearlong	X		X			X	X	X	X	X				X	X										X	X	X
B215	CALIFORNIA GULL	*Larus californicus*	Yearlong	X		X			X	X	X	X					X	X										X	X	X
B216	HERRING GULL	*Larus argentatus*	Fall–Winter	X		X				X	X						X	X												
B221	GLAUCOUS-WINGED GULL	*Larus glaucescens*	Fall–Winter	X		X																								
B227	CASPIAN TERN	*Sterna caspia*	Spring–Summer							X	X	X					X	X												
B233	FORSTER'S TERN	*Sterna forsteri*	Spring–Summer	X						X	X	X					X	X												
B235	BLACK TERN	*Chlidonias niger*	Spring–Summer	X						X		X					X													
B250	ROCK DOVE	*Columba livia*	Yearlong	X	X	X			X				X																	
B251	BAND-TAILED PIGEON	*Columba fasciata*	Yearlong											X	X	X			X	X	X	X	X	X	X	X				
B253	MOURNING DOVE	*Zenaida macroura*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X		X		
B259	YELLOW-BILLED CUCKOO	*Coccyzus americanus*	Spring–Fall				X																							
B260	GREATER ROADRUNNER	*Geococcyx californianus*	Yearlong					X	X					X	X	X														
B262	COMMON BARN OWL	*Tyto alba*	Yearlong	X	X	X	X		X				X	X	X	X			X	X	X	X	X	X				X		
B263	FLAMMULATED OWL	*Otus flammeolus*	Spring–Summer		X		X		X										X	X	X	X	X	X	X	X	X			
B264	WESTERN SCREECH OWL	*Otus kennicottii*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X		X	X	X	X	X		
B265	GREAT HORNED OWL	*Bubo virginianus*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		
B267	NORTHERN PYGMY OWL	*Glaucidium gnoma*	Yearlong		X	X	X		X					X	X	X			X	X	X	X	X	X				X		
B269	BURROWING OWL	*Speotyto cunicularia*	Yearlong	X		X		X					X	X	X	X						X	X					X		
B270	SPOTTED OWL	*Strix occidentalis*	Yearlong												X				X	X	X	X		X	X	X				

				VALLEY FLOOR								FOOTHILL						MOUNTAINS												
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B271	GREAT GRAY OWL	*Strix nebulosa*	Yearlong																					X	X	X			X		
B272	LONG-EARED OWL	*Asio otus*	Yearlong	X		X	X						X	X	X	X			X	X	X	X	X	X					X		
B273	SHORT-EARED OWL	*Asio flammeus*	Yearlong	X		X	X	X	X			X	X	X	X	X				X	X	X		X					X		
B274	NORTHERN SAW-WHET OWL	*Aegolius acadicus*	Yearlong		X	X	X		X					X	X	X			X	X	X	X	X	X	X	X			X		
B275	LESSER NIGHTHAWK	*Chordeiles acutipennis*	Spring-Summer	X	X	X		X		X	X	X	X																			
B276	COMMON NIGHTHAWK	*Chordeiles minor*	Spring-Summer																	X		X	X	X					X	X	X
B277	COMMON POORWILL	*Phalaenoptilus nuttallii*	Spring-Summer	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X
B279	BLACK SWIFT	*Cypseloides niger*	Spring-Summer							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
B281	VAUX'S SWIFT	*Chaetura vauxi*	Spring-Summer	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X					X	X	X
B282	WHITE-THROATED SWIFT	*Aeronautes saxatalis*	Yearlong	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
B286	BLACK-CHINNED HUMMINGBIRD	*Archilochus alexandri*	Spring-Summer		X		X		X					X	X	X					X										
B287	ANNA'S HUMMINGBIRD	*Calypte anna*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X							
B291	RUFOUS HUMMINGBIRD	*Selasphorus rufus*	Spring-Fall				X		X					X	X	X					X								X		
B289	CALLIOPE HUMMINGBIRD	*Stellula calliope*	Spring-Summer		X		X		X					X	X	X			X	X	X	X	X	X	X	X	X	X	X		
B293	BELTED KINGFISHER	*Ceryle alcyon*	Yearlong				X				X	X						X			X							X	X	
B294	LEWIS' WOODPECKER	*Melanerpes lewis*	Winter		X		X						X	X	X	X			X	X	X	X	X	X					X		
B296	ACORN WOODPECKER	*Melanerpes formicivorus*	Yearlong				X		X					X	X				X	X	X			X							
B299	RED-BREASTED SAPSUCKER	*Sphyrapicus ruber*	Yearlong		X		X		X					X	X				X	X	X	X		X	X	X					
B300	WILLIAMSON'S SAPSUCKER	*Sphyrapicus thyroideus*	Yearlong																		X	X		X	X	X					
B302	NUTTALL'S WOODPECKER	*Picoides nuttallii*	Yearlong				X							X	X	X			X	X	X	X	X	X							
B303	DOWNY WOODPECKER	*Picoides pubescens*	Yearlong		X		X		X				X	X	X	X			X	X	X	X	X	X	X	X	X		X		
B304	HAIRY WOODPECKER	*Picoides villosus*	Yearlong											X	X				X	X	X	X		X	X	X	X				
B305	WHITE-HEADED WOODPECKER	*Picoides albolarvatus*	Yearlong																X	X	X	X		X	X	X	X				
B306	BLACK-BACKED WOODPECKER	*Picoides arcticus*	Yearlong																						X	X					
B307	NORTHERN FLICKER	*Colaptes auratus*	Yearlong		X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
B308	PILEATED WOODPECKER	*Dryocopus pileatus*	Yearlong												X				X	X	X	X		X	X	X	X				
B309	OLIVE-SIDED FLYCATCHER	*Contopus borealis*	Spring-Summer																X	X	X	X		X	X	X	X				
B311	WESTERN WOOD-PEWEE	*Contopus sordidulus*	Spring-Summer		X		X		X					X	X				X	X	X	X		X	X	X	X				
B313	WILLOW FLYCATCHER	*Empidonax traillii*	Spring-Summer				X														X								X		
B317	HAMMOND'S FLYCATCHER	*Empidonax hammondii*	Spring-Summer																X	X	X	X		X		X					
B318	DUSKY FLYCATCHER	*Empidonax oberholseri*	Spring-Summer																	X	X	X	X	X	X	X	X				
B319	GRAY FLYCATCHER	*Empidonax wrightii*	Spring-Fall				X	X						X	X	X																
B320	PACIFIC-SLOPE FLYCATCHER	*Empidonax difficilis*	Spring-Summer		X		X		X					X	X				X	X	X	X									
B321	BLACK PHOEBE	*Sayornis nigricans*	Yearlong	X	X	X	X		X			X	X								X										
B323	SAY'S PHOEBE	*Sayornis saya*	Fall-Winter	X		X		X					X	X	X	X															
B326	ASH-THROATED FLYCATCHER	*Myiarchus cinerascens*	Spring-Summer				X							X	X	X						X	X								
B333	WESTERN KINGBIRD	*Tyrannus verticalis*	Spring-Summer	X	X	X	X		X			X	X	X	X	X			X	X		X	X								
B337	HORNED LARK	*Eremophila alpestris*	Yearlong	X		X		X					X	X	X													X			
B338	PURPLE MARTIN	*Progne subis*	Spring-Summer			X	X		X	X	X	X	X	X	X		X	X	X	X	X	X		X					X	X	X
B339	TREE SWALLOW	*Tachycineta bicolor*	Yearlong	X	X	X	X		X	X	X	X	X				X	X			X								X	X	X
B340	VIOLET-GREEN SWALLOW	*Tachycineta thalassina*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X					X	X	X
B341	NORTHERN ROUGH-WINGED SWALLOW	*Stelgidopteryx serripennis*	Spring-Summer	X	X	X	X		X	X	X	X	X				X	X			X								X	X	X
B343	CLIFF SWALLOW	*Hirundo pyrrhonota*	Spring-Summer	X	X	X	X		X	X	X	X	X				X	X			X	X							X	X	X

				VALLEY FLOOR									FOOTHILL						MOUNTAINS											
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B344	BARN SWALLOW	*Hirundo rustica*	Spring–Summer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X
B346	STELLER'S JAY	*Cyanocitta stelleri*	Yearlong											X	X				X	X	X	X		X	X	X	X				
B348	SCRUB JAY	*Aphelocoma coerulescens*	Yearlong		X		X		X					X	X	X			X	X	X		X								
B350	CLARK'S NUTCRACKER	*Nucifraga columbiana*	Yearlong																	X	X	X	X	X	X	X	X	X	X		
B352	YELLOW-BILLED MAGPIE	*Pica nuttalli*	Yearlong	X	X	X	X		X				X	X	X																
B353	AMERICAN CROW	*Corvus brachyrhynchos*	Yearlong	X	X	X	X		X				X	X	X				X	X	X	X		X							
B354	COMMON RAVEN	*Corvus corax*	Yearlong	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B356	MOUNTAIN CHICKADEE	*Parus gambeli*	Yearlong											X	X				X	X	X	X	X	X	X	X	X				
B357	CHESTNUT-BACKED CHICKADEE	*Parus rufescens*	Yearlong																X	X		X		X							
B358	PLAIN TITMOUSE	*Parus inornatus*	Yearlong											X	X				X	X		X									
B360	BUSHTIT	*Psaltriparus minimus*	Yearlong				X		X					X	X	X			X	X	X	X	X	X							
B361	RED-BREASTED NUTHATCH	*Sitta canadensis*	Yearlong		X		X		X					X	X				X	X	X	X		X	X	X	X				
B362	WHITE-BREASTED NUTHATCH	*Sitta carolinensis*	Yearlong		X		X		X					X	X				X	X	X	X		X	X	X	X				
B363	PYGMY NUTHATCH	*Sitta pygmaea*	Yearlong																		X	X		X	X						
B364	BROWN CREEPER	*Certhia americana*	Yearlong		X		X		X					X	X				X	X	X	X		X		X					
B366	ROCK WREN	*Salpinctes obsoletus*	Yearlong					X					X	X	X	X			X	X			X				X	X			
B367	CANYON WREN	*Catherpes mexicanus*	Yearlong		X		X		X					X	X	X			X	X	X	X									
B368	BEWICK'S WREN	*Thryomanes bewickii*	Yearlong		X		X		X						X	X			X	X	X	X	X	X							
B369	HOUSE WREN	*Troglodytes aedon*	Yearlong		X		X		X					X	X	X			X	X	X		X			X	X		X		
B370	WINTER WREN	*Troglodytes troglodytes*	Yearlong		X		X		X											X	X	X		X		X	X				
B372	MARSH WREN	*Cistothorus palustris*	Yearlong				X					X									X								X		
B373	AMERICAN DIPPER	*Cinclus mexicanus*	Yearlong				X			X	X							X	X		X									X	X
B375	GOLDEN-CROWNED KINGLET	*Regulus satrapa*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X	X	X	X				
B376	RUBY-CROWNED KINGLET	*Regulus calendula*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X	X	X	X				
B377	BLUE-GRAY GNATCATCHER	*Poliophila caerulea*	Yearlong				X							X	X	X				X											
B380	WESTERN BLUEBIRD	*Sialia mexicana*	Yearlong				X		X				X	X	X	X			X	X	X	X	X	X		X			X		
B381	MOUNTAIN BLUEBIRD	*Sialia currucoides*	Yearlong	X	X	X							X	X	X						X	X		X	X	X	X	X	X		
B382	TOWNSEND'S SOLITAIRE	*Myadestes townsendi*	Yearlong												X				X		X	X		X	X	X					
B385	SWAINSON'S THRUSH	*Catharus ustulatus*	Spring–Summer		X		X		X					X	X	X			X	X	X	X	X	X	X	X			X		
B386	HERMIT THRUSH	*Catharus guttatus*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X	X	X	X				
B389	AMERICAN ROBIN	*Turdus migratorius*	Yearlong	X	X	X	X		X				X	X	X	X			X	X	X	X	X	X	X	X	X		X		
B390	VARIED THRUSH	*Ixoreus naevius*	Fall–Winter		X		X		X					X	X	X			X	X	X	X	X	X	X	X	X		X		
B391	WRENTIT	*Chamaea fasciata*	Yearlong				X							X	X	X			X	X	X		X								
B393	NORTHERN MOCKINGBIRD	*Mimus polyglottos*	Yearlong	X	X	X	X		X				X	X	X	X															
B398	CALIFORNIA THRASHER	*Toxostoma redivivum*	Yearlong				X							X	X	X			X	X	X		X								
B404	WATER PIPIT	*Anthus spinoletta*	Yearlong	X		X		X	X	X	X	X	X				X	X										X	X	X	X
B407	CEDAR WAXWING	*Bombycilla cedrorum*	Fall–Winter		X		X		X					X	X	X			X	X	X	X		X							
B408	PHAINOPEPLA	*Phainopepla nitens*	Yearlong				X							X	X	X															
B410	LOGGERHEAD SHRIKE	*Lanius ludovicianus*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X							X		
B411	EUROPEAN STARLING	*Sturnus vulgaris*	Yearlong	X	X	X	X		X			X	X	X	X	X			X	X	X	X		X					X		
B415	SOLITARY VIREO	*Vireo solitarius*	Spring–Summer				X		X					X	X				X	X	X	X		X	X	X					
B417	HUTTON'S VIREO	*Vireo huttoni*	Yearlong				X		X					X	X	X			X	X	X	X									
B418	WARBLING VIREO	*Vireo gilvus*	Spring–Summer				X		X					X	X				X	X	X	X		X	X	X					

				VALLEY FLOOR									FOOTHILL						MOUNTAINS												
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B423	ORANGE-CROWNED WARBLER	*Vermivora celata*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X	X	X	X			
B426	NASHVILLE WARBLER	*Vermivora ruficapilla*	Spring-Summer				X		X					X	X	X			X	X	X	X	X	X	X	X	X			
B430	YELLOW WARBLER	*Dendroica petechia*	Spring-Summer				X		X					X	X	X			X	X	X	X	X	X	X	X				
B435	YELLOW-RUMPED WARBLER	*Dendroica coronata*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		
B436	BLACK-THROATED GRAY WARBLER	*Dendroica nigrescens*	Spring-Summer				X		X					X	X	X			X	X	X	X	X	X		X				
B437	TOWNSENDS WARBLER	*Dendroica townsendi*	Fall-Winter		X		X		X					X	X				X	X	X									
B438	HERMIT WARBLER	*Dendroica occidentalis*	Spring-Summer				X		X					X	X				X	X	X	X		X	X	X				
B460	MACGILLIVRAY'S WARBLER	*Oporornis tolmiei*	Spring-Summer				X		X							X			X	X	X	X	X	X					X	
B461	COMMON YELLOWTHROAT	*Geothlypis trichas*	Yearlong				X					X									X								X	
B463	WILSON'S WARBLER	*Wilsonia pusilla*	Spring-Summer				X		X					X	X	X			X	X	X	X	X	X	X	X				
B467	YELLOW-BREASTED CHAT	*Icteria virens*	Spring-Summer				X														X									
B471	WESTERN TANAGER	*Piranga ludoviciana*	Spring-Summer				X		X					X	X				X	X	X	X		X	X	X				
B475	BLACK-HEADED GROSBEAK	*Pheucticus melanocephalus*	Spring-Summer				X		X					X	X	X			X	X	X	X		X						
B476	BLUE GROSBEAK	*Guiraca caerulea*	Spring-Summer	X		X	X						X																	
B477	LAZULI BUNTING	*Passerina amoena*	Spring-Summer				X							X	X	X			X	X	X	X	X	X					X	
B482	GREEN-TAILED TOWHEE	*Pipilo chlorurus*	Spring-Summer																X	X	X	X	X	X	X	X	X			
B483	RUFOUS-SIDED TOWHEE	*Pipilo erythrophthalmus*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X						
B484	CALIFORNIA TOWHEE	*Pipilo fuscus*	Yearlong	X	X	X	X		X					X	X	X			X	X		X	X							
B487	RUFOUS-CROWNED SPARROW	*Aimophila ruficeps*	Yearlong										X	X	X	X							X							
B489	CHIPPING SPARROW	*Spizella passerina*	Yearlong	X	X	X	X						X	X	X	X			X	X	X	X	X	X	X	X	X		X		
B491	BREWER'S SPARROW	*Spizella breweri*	Spring-Summer					X						X	X	X							X							
B493	BLACK-CHINNED SPARROW	*Spizella atrogularis*	Spring-Summer													X							X							
B494	VESPER SPARROW	*Pooecetes gramineus*	Fall-Winter	X		X		X					X	X	X	X														
B495	LARK SPARROW	*Chondestes grammacus*	Yearlong	X	X	X	X	X					X	X	X	X			X	X		X								
B499	SAVANNAH SPARROW	*Passerculus sandwichensis*	Fall-Winter	X	X	X	X	X		X			X	X	X	X	X													
B501	GRASSHOPPER SPARROW	*Ammodramus savannarum*	Spring-Summer			X							X																X	
B504	FOX SPARROW	*Passerella iliaca*	Yearlong		X		X	X	X					X	X	X			X	X	X	X	X	X	X	X			X	
B505	SONG SPARROW	*Melospiza melodia*	Yearlong	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X		X					X	X	X
B506	LINCOLN'S SPARROW	*Melospiza lincolnii*	Yearlong	X	X	X	X		X			X		X	X				X	X	X	X		X	X				X		
B508	WHITE-THROATED SPARROW	*Zonotrichia albicollis*	Winter				X		X																						
B509	GOLDEN-CROWNED SPARROW	*Zonotrichia atricapilla*	Fall-Winter	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X		X			X		
B510	WHITE-CROWNED SPARROW	*Zonotrichia leucophrys*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
B512	DARK-EYED JUNCO	*Junco hyemalis*	Yearlong	X	X		X	X	X					X	X	X			X	X	X	X	X	X	X	X	X				
B519	RED-WINGED BLACKBIRD	*Agelaius phoeniceus*	Yearlong	X	X	X	X		X			X	X								X								X	
B520	TRICOLORED BLACKBIRD	*Agelaius tricolor*	Yearlong	X	X	X			X			X	X																		
B521	WESTERN MEADOWLARK	*Sturnella neglecta*	Yearlong	X		X			X				X	X	X	X														
B522	YELLOW-HEADED BLACKBIRD	*Xanthocephalus xanthocephalus*	Yearlong	X		X				X		X	X				X													
B524	BREWER'S BLACKBIRD	*Euphagus cyanocephalus*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X
B528	BROWN-HEADED COWBIRD	*Molothrus ater*	Yearlong	X	X	X	X		X			X	X	X	X				X	X	X	X		X	X	X			X		
B530	HOODED ORIOLE	*Icterus cucullatus*	Spring-Summer		X		X		X																						
B532	NORTHERN ORIOLE	*Icterus galbula*	Spring-Summer		X	X	X		X					X	X				X	X	X	X									
B534	ROSY FINCH	*Leucosticte arctoa*	Yearlong																							X	X				
B535	PINE GROSBEAK	*Pinicola enucleator*	Yearlong																		X				X	X	X		X		

				VALLEY FLOOR									FOOTHILL						MOUNTAINS												
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B536	PURPLE FINCH	*Carpodacus purpureus*	Yearlong		X		X		X					X	X	X			X	X	X	X		X				X		
B537	CASSIN'S FINCH	*Carpodacus cassinii*	Yearlong													X					X	X		X	X	X	X		X		
B538	HOUSE FINCH	*Carpodacus mexicanus*	Yearlong	X	X	X	X	X	X				X	X	X	X															
B539	RED CROSSBILL	*Loxia curvirostra*	Yearlong						X												X	X		X	X	X	X				
B542	PINE SISKIN	*Carduelis pinus*	Yearlong	X	X	X	X		X				X	X	X				X	X	X	X		X	X	X	X		X		
B543	LESSER GOLDFINCH	*Carduelis psaltria*	Yearlong	X	X	X	X		X				X	X	X	X			X	X	X	X	X	X	X	X	X		X		
B544	LAWRENCE'S GOLDFINCH	*Carduelis lawrencei*	Spring–Summer										X	X	X	X			X	X	X	X							X		
B545	AMERICAN GOLDFINCH	*Carduelis tristis*	Yearlong		X	X	X		X				X	X	X	X			X	X	X								X		
B546	EVENING GROSBEAK	*Coccothraustes vespertinus*	Yearlong		X		X		X					X	X	X			X	X	X	X	X	X	X	X					
B547	HOUSE SPARROW	*Passer domesticus*	Yearlong	X	X	X			X					X	X																	
M001	VIRGINIA OPOSSUM	*Didelphis virginiana*	Yearlong	X	X	X	X		X			X	X	X	X	X			X	X	X	X	X	X					X		
M002	MT. LYELL SHREW	*Sorex lyelli*	Yearlong																		X								X		
M004	DUSKY SHREW	*Sorex monticolus*	Yearlong																		X	X		X	X	X	X	X	X		
M006	ORNATE SHREW	*Sorex ornatus*	Yearlong				X					X	X	X	X	X				X	X	X	X								
M010	WATER SHREW	*Sorex palustris*	Yearlong																		X			X	X	X	X		X	X	X
M012	TROWBRIDGE'S SHREW	*Sorex trowbridgii*	Yearlong											X	X	X				X	X	X	X	X		X					
M018	BROAD–FOOTED MOLE	*Scapanus latimanus*	Yearlong	X	X	X	X						X	X	X				X	X	X	X		X	X	X			X		
M021	LITTLE BROWN MYOTIS	*Myotis lucifugus*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
M023	YUMA MYOTIS	*Myotis yumanensis*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
M025	LONG–EARED MYOTIS	*Myotis evotis*	Yearlong	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
M026	FRINGED MYOTIS	*Myotis thysanodes*	Yearlong	X		X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
M027	LONG–LEGGED MYOTIS	*Myotis volans*	Yearlong	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
M028	CALIFORNIA MYOTIS	*Myotis californicus*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
M029	SMALL–FOOTED MYOTIS	*Myotis leibii*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X
M030	SILVER–HAIRED BAT	*Lasionycteris noctivigans*	Yearlong	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
M031	WESTERN PIPISTRELLE	*Pipistrellus hesperus*	Yearlong	X	X	X	X	X	X		X		X	X	X	X		X	X	X	X	X	X	X					X	X	
M032	BIG BROWN BAT	*Eptesicus fuscus*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
M033	RED BAT	*Lasiurus borealis*	Yearlong	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X
M034	HOARY BAT	*Lasiurus cinereus*	Yearlong	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
M036	SPOTTED BAT	*Euderma maculatum*	Yearlong				X	X	X		X		X	X	X			X		X		X	X	X					X	X	
M037	TOWNSEND'S BIG–EARED BAT	*Plecotus townsendii*	Yearlong	X	X	X	X	X	X		X		X	X	X	X		X	X	X	X	X	X	X	X	X			X	X	
M038	PALLID BAT	*Antrozous pallidus*	Yearlong	X	X	X	X	X	X		X		X	X	X	X		X	X	X	X	X	X	X	X	X			X	X	
M039	BRAZILIAN FREE–TAILED BAT	*Tadarida brasiliensis*	Yearlong	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X	
M042	WESTERN MASTIFF BAT	*Eumops perotis*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X								
M043	PIKA	*Ochotona princeps*	Yearlong																		X	X	X	X	X	X	X	X			
M045	BRUSH RABBIT	*Sylvilagus bachmani*	Yearlong										X	X	X	X			X	X	X	X	X	X				X			
M047	DESERT COTTONTAIL	*Sylvilagus audubonii*	Yearlong	X	X	X	X	X	X				X	X	X																
M049	SNOWSHOE HARE	*Lepus americanus*	Yearlong																		X			X	X	X	X				
M050	WHITE–TAILED HARE	*Lepus townsendii*	Yearlong																						X	X	X	X	X		
M051	BLACK–TAILED HARE	*Lepus californicus*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X			X		
M052	MOUNTAIN BEAVER	*Aplodontia rufa*	Yearlong																X	X	X	X		X	X	X	X		X		
M053	ALPINE CHIPMUNK	*Tamias alpinus*	Yearlong																								X	X			
M054	LEAST CHIPMUNK	*Tamias minimus*	Yearlong																												

				VALLEY FLOOR									FOOTHILL						MOUNTAINS											
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
M152	RINGTAIL	*Bassariscus astutus*	Yearlong				X						X	X	X	X			X	X	X	X	X	X					X		
M153	RACCOON	*Procyon lotor*	Yearlong	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
M154	MARTEN	*Martes americana*	Yearlong																	X	X	X		X	X	X	X		X		
M155	FISHER	*Martes pennanti*	Yearlong																	X	X	X		X	X	X	X				
M156	ERMINE	*Mustela erminea*	Yearlong																X	X	X	X	X	X	X	X	X	X	X		
M157	LONG-TAILED WEASEL	*Mustela frenata*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M158	MINK	*Mustela vison*	Yearlong				X			X	X	X					X	X			X									X	X
M159	WOLVERINE	*Gulo gulo*	Yearlong																	X	X		X	X	X	X	X	X	X		
M160	BADGER	*Taxidea taxus*	Yearlong	X	X	X	X	X					X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M161	WESTERN SPOTTED SKUNK	*Spilogale gracilis*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X			X		
M162	STRIPED SKUNK	*Mephitis mephitis*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X	X		X		
M163	RIVER OTTER	*Lutra canadensis*	Yearlong				X			X	X	X					X	X			X										
M165	MOUNTAIN LION	*Felis concolor*	Yearlong										X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M166	BOBCAT	*Felis rufus*	Yearlong	X	X	X	X	X				X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M176	WILD PIG	*Sus scrofa*	Yearlong											X	X	X			X												
M181	MULE DEER	*Odocoileus hemionus*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
R004	WESTERN POND TURTLE	*Clemmys marmorata*	Yearlong			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X							
R019	BLUNT-NOSED LEOPARD LIZARD	*Gambelia silus*	Yearlong				X	X					X	X																	
R022	WESTERN FENCE LIZARD	*Sceloporus occidentalis*	Yearlong	X	X	X	X						X	X	X	X			X	X	X	X	X	X	X						
R023	SAGEBRUSH LIZARD	*Sceloporus graciosus*	Yearlong																X	X		X	X	X	X						
R024	SIDE-BLOTCHED LIZARD	*Uta stansburiana*	Yearlong				X	X					X	X	X	X															
R029	COAST HORNED LIZARD	*Phrynosoma coronatum*	Yearlong		X		X						X	X	X	X				X		X									
R037	GILBERT'S SKINK	*Eumeces gilberti*	Yearlong		X	X	X						X	X	X	X			X	X		X									
R039	WESTERN WHIPTAIL	*Cnemidophorus tigris*	Yearlong				X	X					X	X	X	X								X							
R040	SOUTHERN ALLIGATOR LIZARD	*Gerrhonotus multicarinatus*	Yearlong	X	X	X	X						X	X	X	X						X		X							
R042	NORTHERN ALLIGATOR LIZARD	*Gerrhonotus coeruleus*	Yearlong											X	X	X			X	X	X	X	X	X	X	X	X				
R046	RUBBER BOA	*Charina bottae*	Yearlong																X	X	X	X	X	X	X	X			X		
R048	RINGNECK SNAKE	*Diadophis punctatus*	Yearlong				X						X	X	X	X			X	X		X		X							
R049	SHARP-TAILED SNAKE	*Contia tenuis*	Yearlong				X							X	X	X			X	X		X		X					X		
R051	RACER	*Coluber constrictor*	Yearlong	X	X	X	X					X	X	X	X	X			X	X		X		X					X		
R052	COACHWHIP	*Masticophis flagellum*	Yearlong			X	X	X					X	X	X	X															
R053	CALIFORNIA WHIPSNAKE	*Masticophis lateralis*	Yearlong				X							X	X	X				X	X	X	X	X							
R056	GLOSSY SNAKE	*Arizona elegans*	Yearlong	X		X		X					X	X		X															
R057	GOPHER SNAKE	*Pituophis melanoleucus*	Yearlong	X	X	X	X	X					X	X	X	X			X	X	X	X	X	X					X		
R058	COMMON KINGSNAKE	*Lampropeltis getulus*	Yearlong	X	X	X	X	X				X	X	X	X	X			X	X	X	X	X	X					X		
R059	CALIFORNIA MOUNTAIN KINGSNAKE	*Lampropeltis zonata*	Yearlong											X	X	X			X	X	X	X	X	X					X		
R060	LONG-NOSED SNAKE	*Rhinocheilus lecontei*	Yearlong					X					X	X	X	X															
R061	COMMON GARTER SNAKE	*Thamnophis sitalis*	Yearlong	X	X	X	X			X		X	X	X	X	X	X		X	X	X	X	X	X					X		X
R062	WESTERN TERRESTRIAL GARTER SNAKE	*Thamnophis elegans*	Yearlong										X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X
R063	WESTERN AQUATIC GARTER SNAKE	*Thamnophis couchi*	Yearlong										X	X	X	X	X	X	X	X	X	X	X	X					X	X	X
	GIANT GARTER SNAKE	*Thamnophis gigas*	yearlong			X	X					X																			
R071	NIGHT SNAKE	*Hypsiglena torquata*	Yearlong										X	X	X	X						X		X							
R076	WESTERN RATTLESNAKE	*Crotalus viridis*	Yearlong			X	X		X			X	X	X	X	X			X	X	X	X	X	X	X	X		X			

				VALLEY FLOOR									FOOTHILL						MOUNTAINS												
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
M055	YELLOW PINE CHIPMUNK	*Tamias amoenus*	Yearlong																												
M057	ALLEN'S CHIPMUNK	*Tamias senex*	Yearlong											X	X	X			X	X	X		X	X	X	X	X				
M060	MERRIAM'S CHIPMUNK	*Tamias merriami*	Yearlong				X						X	X	X	X			X	X	X	X	X	X							
M062	LONG-EARED CHIPMUNK	*Tamias quadrimaculatus*	Yearlong													X						X		X							
M063	LODGEPOLE CHIPMUNK	*Tamias speciosus*	Yearlong																					X	X	X	X				
M065	UINTA CHIPMUNK	*Tamias umbrinus*	Yearlong																						X		X				
M066	YELLOW-BELLIED MARMOT	*Marmota flaviventris*	Yearlong																		X		X	X	X	X	X	X	X		
M070	BELDING'S GROUND SQUIRREL	*Spermophilus beldingi*	Yearlong																		X				X	X	X	X	X		
M072	CALIFORNIA GROUND SQUIRREL	*Spermophilus beecheyi*	Yearlong	X	X	X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M075	GOLDEN-MANTLED GROUND SQUIRREL	*Spermophilus lateralis*	Yearlong													X			X	X	X	X	X	X	X	X	X	X	X		
M077	WESTERN GRAY SQUIRREL	*Sciurus griseus*	Yearlong											X	X	X			X	X	X	X	X	X							
M079	DOUGLAS' SQUIRREL	*Tamiasciurus douglasii*	Yearlong																X	X	X	X		X	X	X	X				
M080	NORTHERN FLYING SQUIRREL	*Glaucomys sabrinus*	Yearlong																X	X	X	X		X	X	X	X				
M081	BOTTA'S POCKET GOPHER	*Thomomys bottae*	Yearlong	X		X	X	X	X				X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M085	MOUNTAIN POCKET GOPHER	*Thomomys monticola*	Yearlong																	X		X	X	X	X	X	X	X	X		
M087	SAN JOAQUIN POCKET MOUSE	*Perognathus inornatus*	Yearlong			X							X	X		X															
M095	CALIFORNIA POCKET MOUSE	*Chaetodipus californicus*	Yearlong										X	X	X	X			X				X								
M104	HEERMANN'S KANGAROO RAT	*Dipodomys heermanni*	Yearlong		X	X		X					X	X	X	X															
M111	SAN JOAQUIN KANGAROO RAT	*Dipodomys nitratoides*	Yearlong			X		X					X	X																	
M112	BEAVER	*Castor canadensis*	Yearlong				X			X	X	X	X	X			X	X		X	X		X	X	X	X	X		X	X	X
M113	WESTERN HARVEST MOUSE	*Reithrodontomys megalotis*	Yearlong	X	X	X	X	X				X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M116	CALIFORNIA MOUSE	*Peromyscus californicus*	Yearlong				X							X	X	X			X	X	X	X	X	X							
M117	DEER MOUSE	*Peromyscus maniculatus*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M119	BRUSH MOUSE	*Peromyscus boylii*	Yearlong				X						X	X	X	X			X	X	X	X	X	X							
M120	PINYON MOUSE	*Peromyscus truei*	Yearlong				X	X					X			X			X	X	X	X	X	X					X		
M122	SOUTHERN GRASSHOPPER MOUSE	*Onychomys torridus*	Yearlong				X	X					X			X					X										
M127	DUSKY-FOOTED WOODRAT	*Neotoma fuscipes*	Yearlong				X							X	X	X			X	X	X	X	X	X					X		
M128	BUSHY-TAILED WOODRAT	*Neotoma cinerea*	Yearlong										X	X	X	X			X	X	X		X	X	X	X	X	X	X		
M130	HEATHER VOLE	*Phenacomys intermedius*	Yearlong																	X	X		X	X	X	X	X	X	X		
M133	MONTANE VOLE	*Microtus montanus*	Yearlong																		X	X	X	X	X	X	X	X	X		
M134	CALIFORNIA VOLE	*Microtus californicus*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X					X		
M136	LONG-TAILED VOLE	*Microtus longicaudus*	Yearlong																	X	X	X	X	X	X	X	X	X	X		
M139	MUSKRAT	*Ondatra zibethicus*	Yearlong				X			X	X	X					X	X			X										
M140	BLACK RAT	*Rattus rattus*	Yearlong	X			X		X						X																
M141	NORWAY RAT	*Rattus norvegicus*	Yearlong	X	X	X	X		X												X										
M142	HOUSE MOUSE	*Mus musculus*	Yearlong	X	X	X	X		X				X							X			X	X				X		
M143	WESTERN JUMPING MOUSE	*Zapus princeps*	Yearlong																		X			X	X	X	X	X	X		
M145	PORCUPINE	*Erethizon dorsatum*	Yearlong											X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M146	COYOTE	*Canis latrans*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X		
M147	RED FOX	*Vulpes vulpes*	Yearlong	X	X	X							X			X				X	X	X	X	X	X	X	X	X		
M148	KIT FOX	*Vulpes macrotis*	Yearlong			X		X					X																		
M149	GRAY FOX	*Urocyon cinereoargenteus*	Yearlong	X	X	X	X	X	X			X	X	X	X	X			X	X	X	X	X	X					X		
M151	BLACK BEAR	*Ursus americanus*	Yearlong												X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

KEY TO WHR HABITAT TYPES:

SAN JOAQUIN VALLEY

1 Cropland
2 Orchard–Vineyard
3 Pasture
4 Valley–Foothill Riparian
5 Alkali Scrub
6 Residential/Park
7 Lacustrine
8 Riverine
9 Fresh Emergent Wetland

SIERRA NEVEDA FOOTHILLS

10 Annual Grassland
11 Valley–Foothill Hardwood
12 Valley–Foothill Hardwood–Conifer
13 Mixed Chaparral
14 Lacustrine
15 Riverine

SIERRA NEVEDA MOUNTAINS

16 Montane Hardwood
17 Montane Hardwood–Conifer
18 Montane Riparian
19 Ponderosa Pine
20 Montane Chaparral
21 Mixed Conifer
22 Lodgepole Pine
23 Red Fir
24 Subalpine Conifer
25 Alpine Dwarf Shrub
26 Wet Meadow
27 Riverine
28 Lacustrine

APPENDIX C
TRAFFIC ASSUMPTIONS FOR NOISE MODELLING

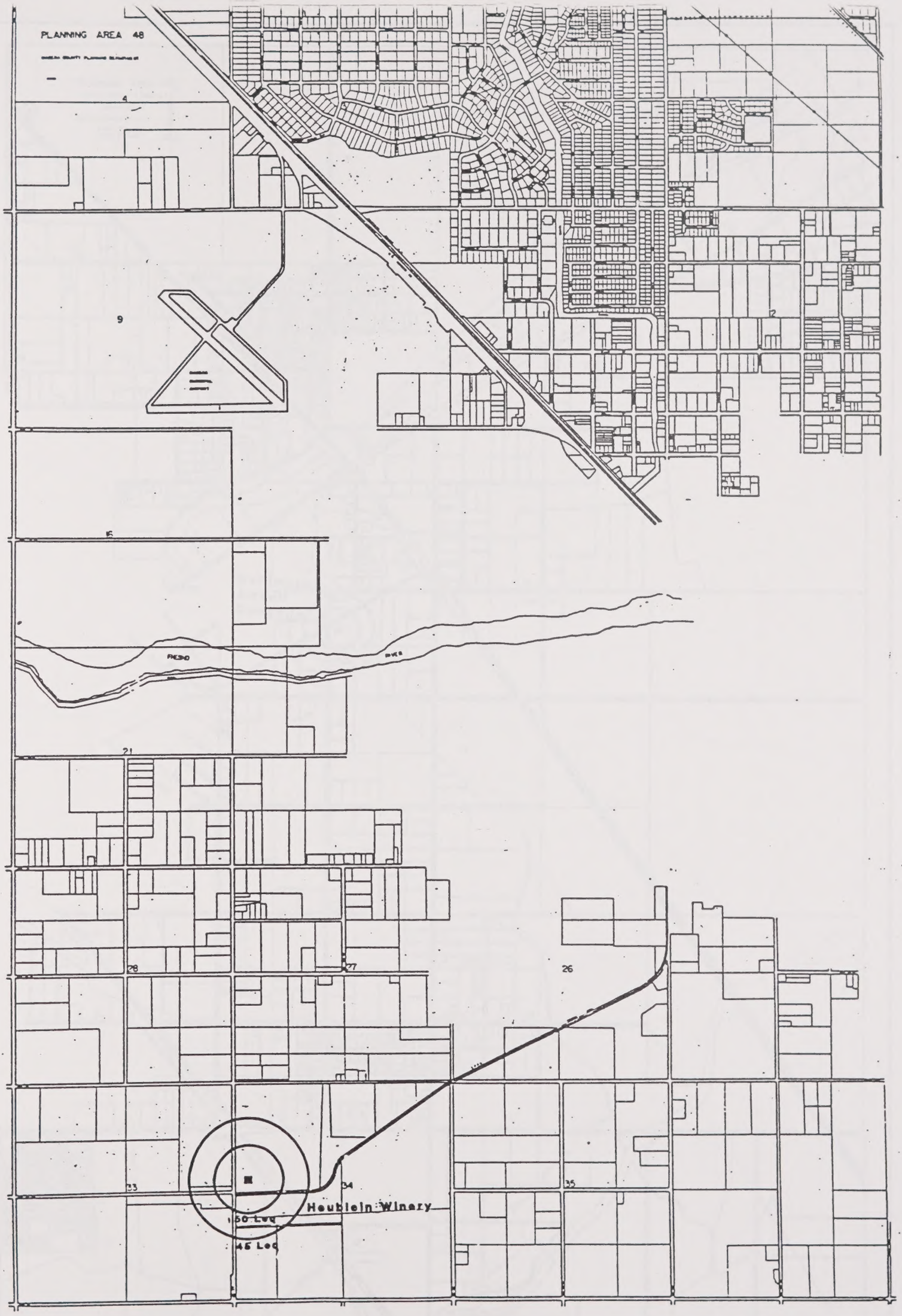
FHWA Model RD-77-108: Brown-Buntin Associates, Inc.
Calveno Emission Curves Run Date: 08-23-1993
Project Number: 93-025 Run Time: 13:45:19
Year: 1993
Soft Site

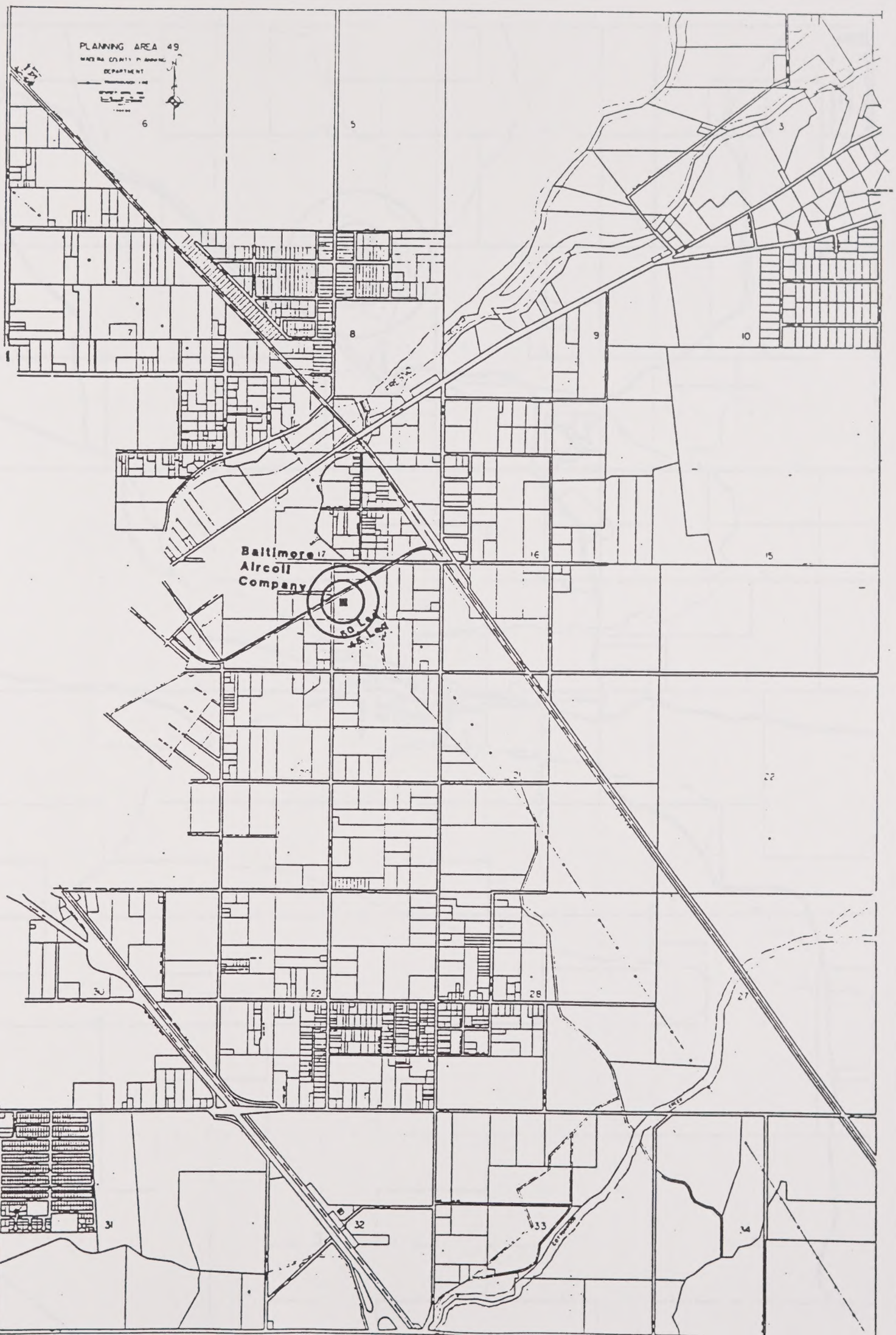
INPUT DATA SUMMARY:

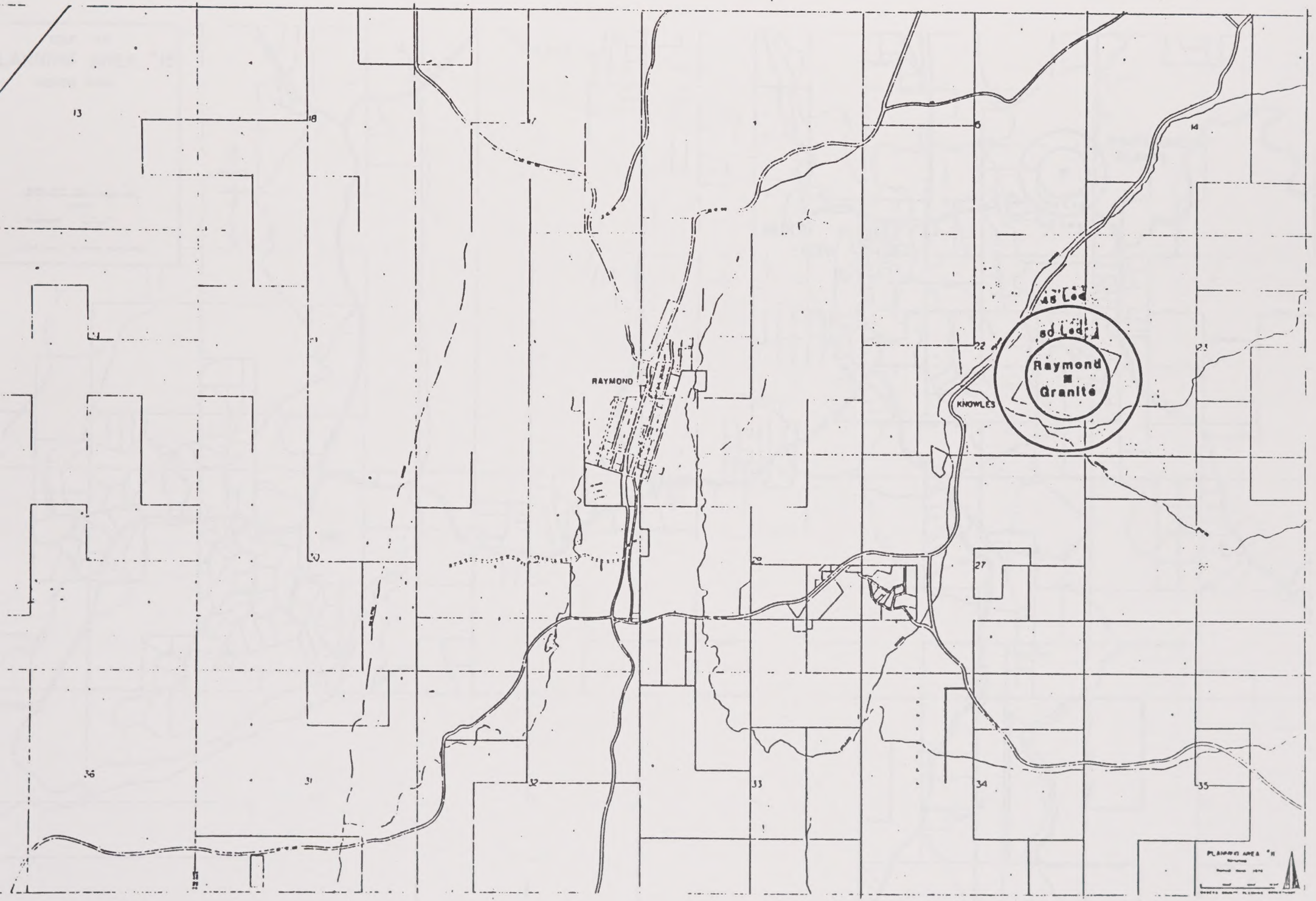
Segment	ADT	Day%	Eve%	Nite%	%MT	%HT	Speed	Distance	Offset
1	2815	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
2	3410	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
3	4374	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
4	2613	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
5	3890	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
6	4588	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
7	4150	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
8	2915	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
9	2975	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
10	7971	90.0	0.0	10.0	5.0	10.0	45.0	100.0	0.0
11	4798	90.0	0.0	10.0	5.0	10.0	45.0	100.0	0.0
12	4150	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
13	5988	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
14	2340	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
15	3915	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
16	2063	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
17	1992	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
18	3521	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
19	4324	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
20	2471	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
21	16112	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
22	15666	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
23	7073	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
24	5147	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
25	3951	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
26	3597	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
27	4316	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
28	4135	90.0	0.0	10.0	5.0	10.0	55.0	100.0	0.0
29	2318	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
30	3736	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
31	15422	90.0	0.0	10.0	5.0	5.0	35.0	100.0	0.0
32	8054	90.0	0.0	10.0	5.0	5.0	35.0	100.0	0.0
33	5128	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
34	4820	90.0	0.0	10.0	5.0	5.0	55.0	100.0	0.0
35	16600	93.0	0.0	7.0	5.0	3.0	55.0	100.0	0.0
36	8500	93.0	0.0	7.0	5.0	3.0	55.0	100.0	0.0
37	16000	93.0	0.0	7.0	5.0	3.0	55.0	100.0	0.0
38	10000	93.0	0.0	7.0	5.0	3.0	55.0	100.0	0.0
39	3900	93.0	0.0	7.0	5.0	3.0	55.0	100.0	0.0
40	4350	90.0	0.0	10.0	4.0	7.0	55.0	100.0	0.0
41	45000	84.0	0.0	16.0	3.0	15.0	65.0	100.0	0.0
42	33200	84.0	0.0	16.0	4.0	18.0	55.0	100.0	0.0
43	9000	87.0	0.0	13.0	1.0	6.0	55.0	100.0	0.0

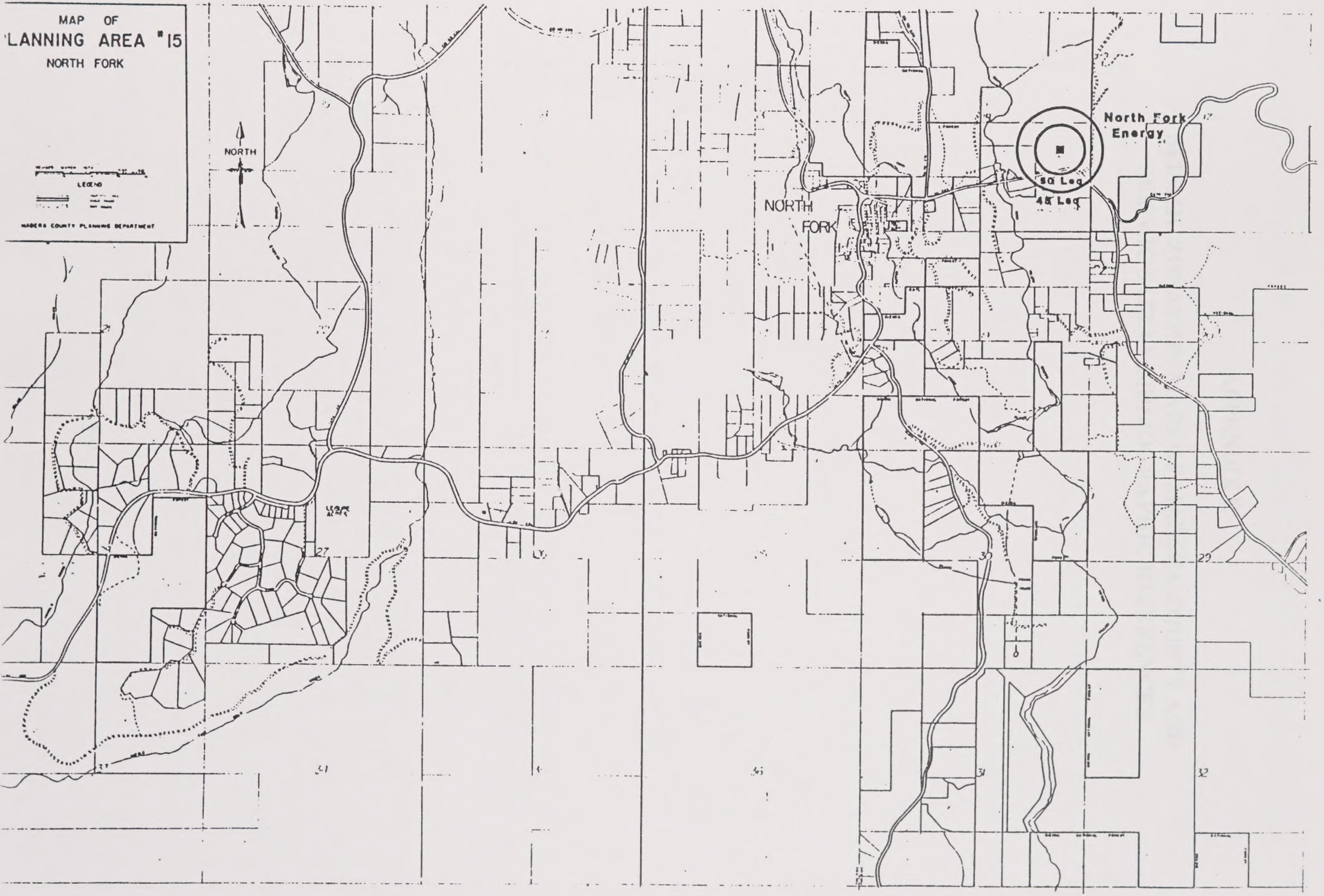
APPENDIX D

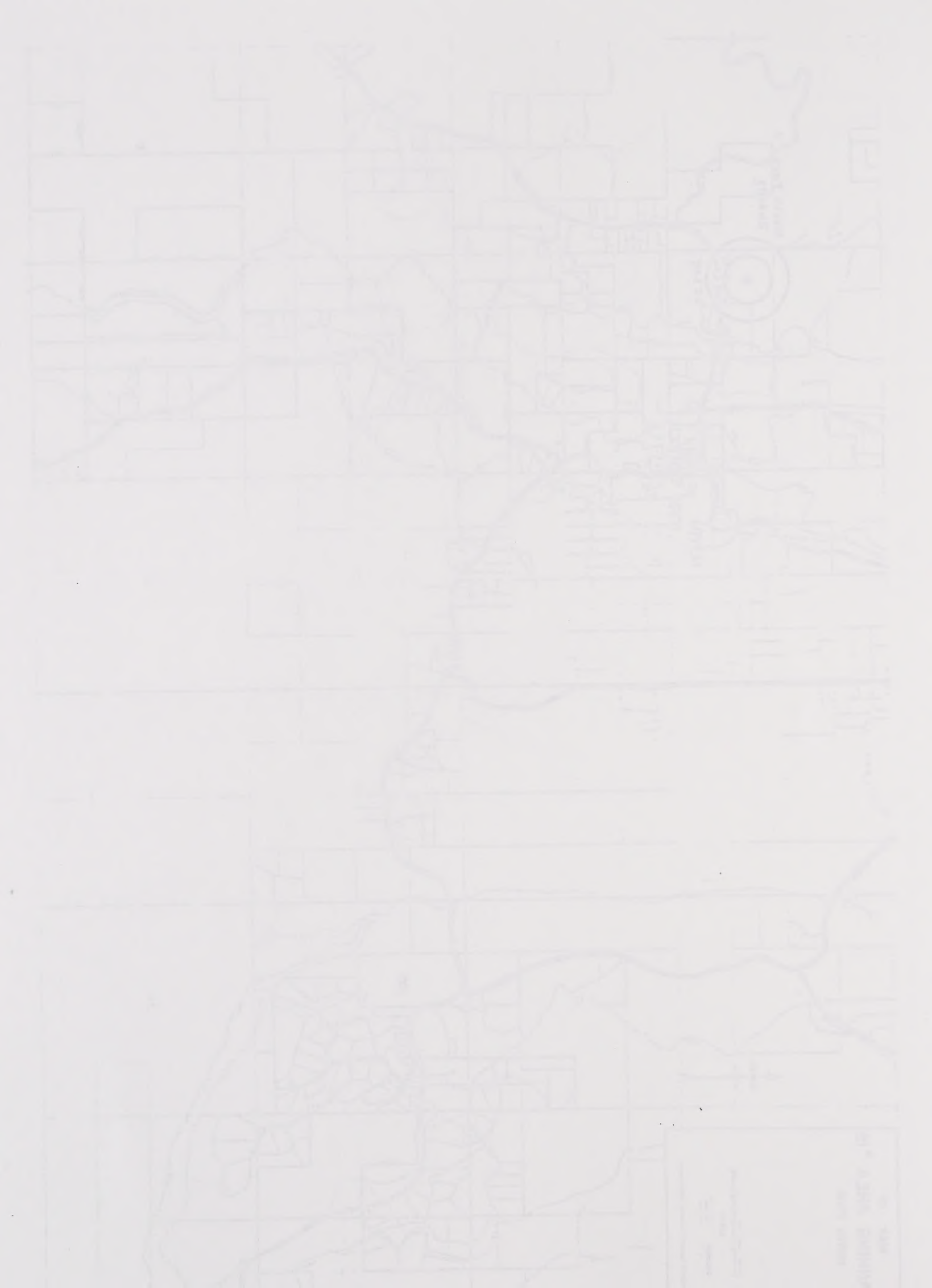
INDUSTRIAL NOISE MONITORING SITES


PLANNING AREA 48
4
9
12
15
21
28
27
26
33
34
35
Heublein Winery
150 Leq
45 Leq


PLANNING AREA 49
Baltimore
Aircoil
Company
50 Ldn
55 Ldn


RAYMOND
KNOWLES
Raymond
Granite


MAP OF
PLANNING AREA #15
NORTH FORK
NORTH
LEGEND
MADERA COUNTY PLANNING DEPARTMENT
NORTH
FORK
North Fork
Energy
5a Leg
4a Leg

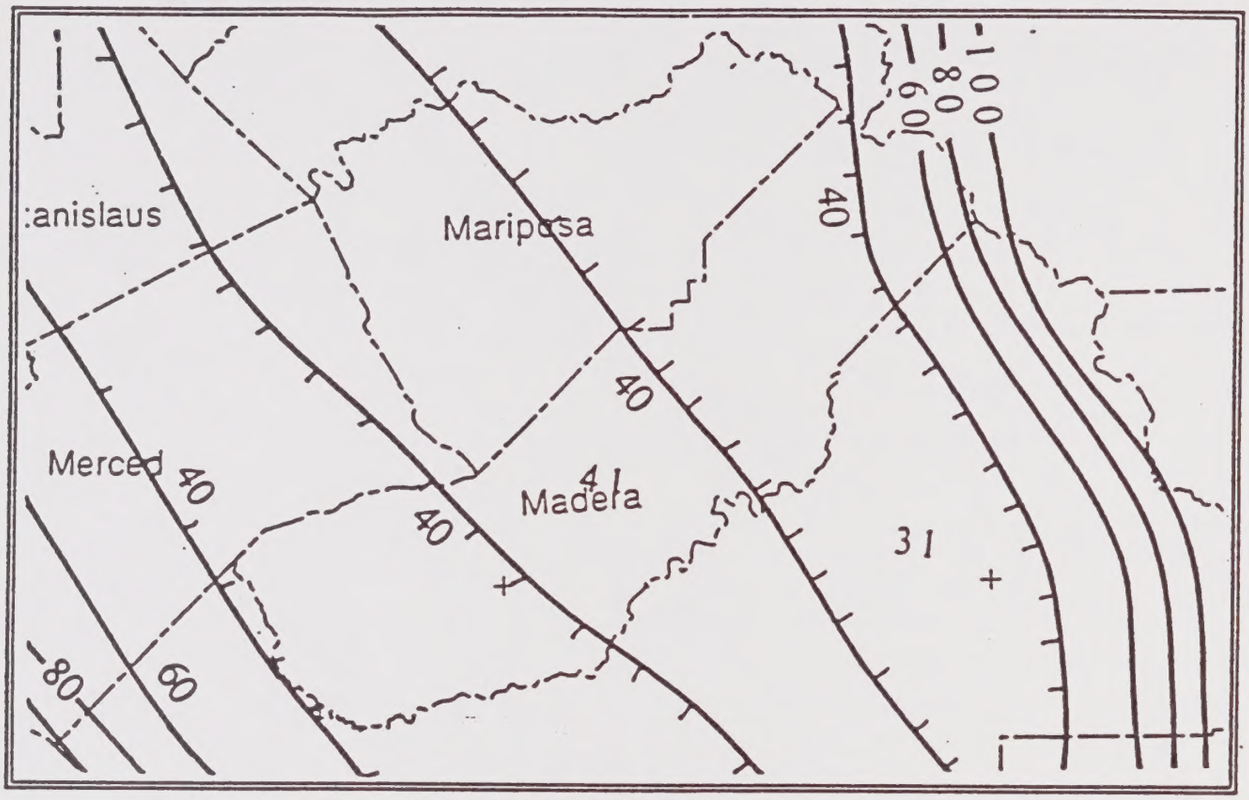


APPENDIX E

SEISMIC ZONATION MAPS OF MADERA COUNTY AND SEISMIC SAFETY BIBLIOGRAPHIC REFERENCES

Seismic Zonation Map for the County of Madera

FEMA Map 10:
Maximum 0.3 second spectral response acceleration (in percent gravity), with a 90 percent probability of non-exceedance in 250 years.



Scale 1:1,500,000
1 inch ≈ 23.7 miles 1 cm = 15 km

Extract from: Building Seismic Safety Council, 1991, NEHRP recommended provisions for the development of seismic regulations for new buildings: Federal Emergency Management Agency, FEMA Report 222.

MAP 10

Preliminary map of the maximum 0.3 second spectral response acceleration[1,2], $S_{A(0.3)}$, with a 90 percent probability of nonexceedance in 250 years. The map values include estimates of variability in the attenuation of spectral acceleration and in fault rupture length.

These maps are presented to introduce new and relevant data for estimating spectral response acceleration. They should not be used for design at this time but should be evaluated by trial design. Review and comments on these maps are invited. Direct comments to the BSSC, 1201 L St., N.W., Suite 400, Washington, D.C. 20005.

The estimation of low values of probability of ground motion (250-year exposure time) may give unrealistic values of spectral acceleration because of uncertainty in attenuation of spectral values and in fault rupture length. The uncertainty is increased in the central and eastern United States because of the difficulty of defining earthquake source zones and the infrequency of earthquake occurrence. Thus, any values on this map should be considered advisory and treated with caution.

Prepared by the U.S. Geological Survey for the 1991 Edition of the *NEHRP Recommended Provisions for the Development of Seismic Regulations for new Buildings.*

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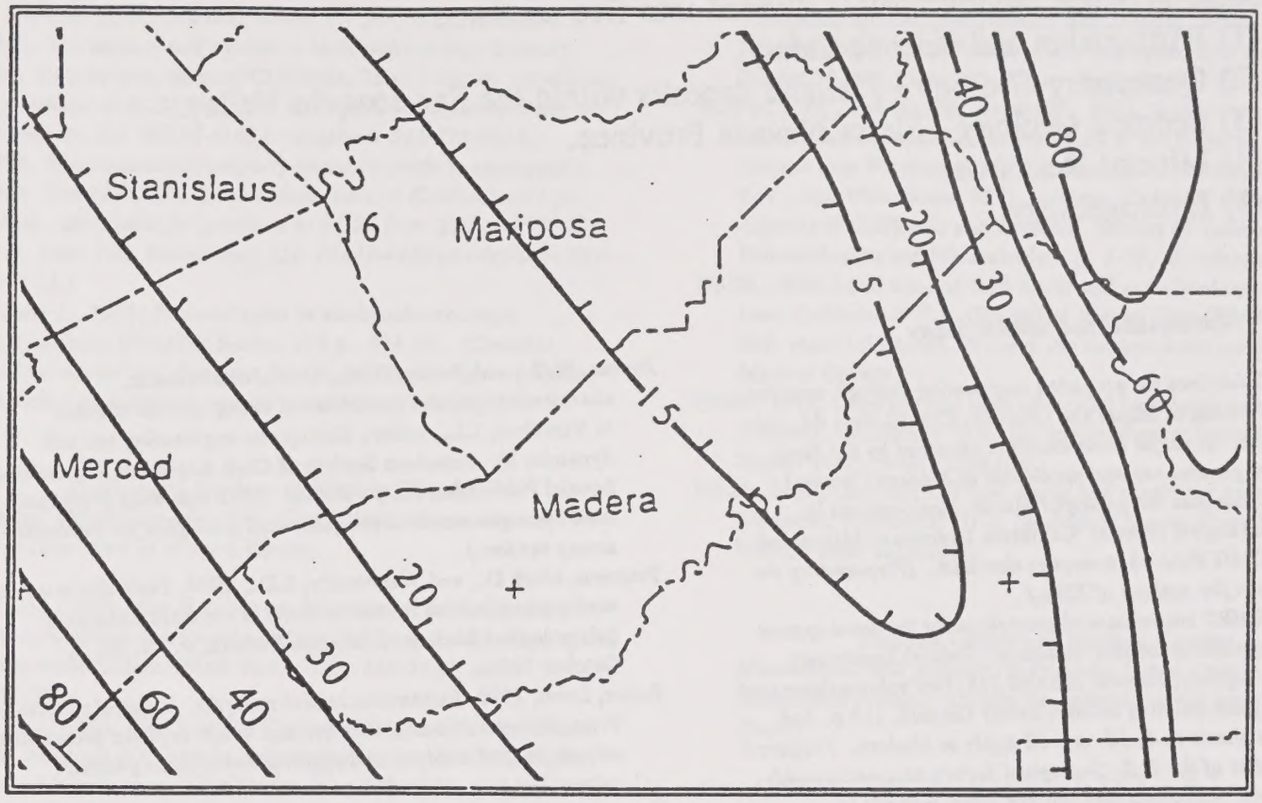
1 Expressed in percent of the acceleration of gravity. Values of spectral response acceleration from the map are divided by 100 for use in the terms in the Appendix to Chapter 1.

2 Effective peak acceleration (A_a) may be determined approximately by dividing map values of spectral response acceleration (in percent of the acceleration of gravity) by 2.5.

Seismic Zonation Map for the County of Madera

FEMA Map 12:
Maximum 1.0 second spectral response acceleration (in percent gravity), with a 90 percent probability of non-exceedance in 250 years.



Scale 1:1,500,000
1 inch ≈ 23.7 miles 1 cm = 15 km

Extract from: Building Seismic Safety Council, 1991, NEHRP recommended provisions for the development of seismic regulations for new buildings: Federal Emergency Management Agency, FEMA Report 222.

MAP 12

Preliminary map of the maximum 1.0 second spectral response acceleration[1], $S_{A(1.0)}$, with a 90 percent probability of nonexceedance in 250 years. The map values include estimates of variability in the attenuation of spectral acceleration and in fault rupture length.

These maps are presented to introduce new and relevant data for estimating spectral response acceleration. They should not be used for design at this time but should be evaluated by trial design. Review and comments on these maps are invited. Direct comments to the BSSC, 1201 L St., N.W., Suite 400, Washington, D.C. 20005.

The estimation of low values of probability of ground motion (250-year exposure time) may give unrealistic values of spectral acceleration because of uncertainty in attenuation of spectral values and in fault rupture length. The uncertainty is increased in the central and eastern United States because of the difficulty of defining earthquake source zones and the infrequency of earthquake occurrence. Thus, any values on this map should be considered advisory and treated with caution.

Prepared by the U.S. Geological Survey for the 1991 Edition of the *NEHRP Recommended Provisions for the Development of Seismic Regulations for new Buildings.*

[1] Expressed in percent of the acceleration of gravity. Values of spectral response acceleration from the map are divided by 100 for use in the terms in the Appendix to Chapter 1.

Selected Geologic Bibliography for the General Plan of the County of Madera

Prepared in August 1994 by the California Department of Conservation Division of Mines and Geology

The selected geologic bibliography is divided into five sections:

(1) Earthquakes and Seismic Safety.
(2) Quaternary Geology - Flatland deposits within the San Joaquin Valley.
(3) Bedrock Geology - Sierra Nevada Province.
(4) Mineral Resources.
(5) Hydrogeology.

Earthquakes and Seismic Safety

CDMG, 1986, Guidelines for preparing engineering geologic reports: California Division of Mines and Geology, CDMG Note 44, two-page checklist. *(A useful basic checklist prepared by the State Geologist for general use and applicable to Madera County.)*

CDMG, 1982, Guidelines for geologic/seismic considerations in environmental impact reports: California Division of Mines and Geology, CDMG Note 46, two-page checklist. *(Prepared by the State Geologist for authors of EIRs.)*

FEMA, 1991, NEHRP recommended provisions for the development of seismic regulations for new buildings: Federal Emergency Management Agency, Reports 222 and 223, two volumes prepared for FEMA by the Building Seismic Safety Council, 119 p. and 237 p. *(Map sheets 6, 8, 10, and 12 apply to Madera. Prepared by seismologists of the U.S. Geological Survey as a nation-wide effort in seismic microzonation utilizing latest methods in probabilistic seismic hazard mapping.)*

Hart, E.W., 1994, Fault-rupture hazard zones in California: California Division of Mines and Geology, Special Publication 42, 1992 revised edition, 34 p. *(This is the official publication to cite when an author of an Environmental Impact Report wants to state reliably that there are no active faults and no Alquist-Priolo Earthquake Fault Zones in Madera County.)*

Hill, D.P., Eaton, J.P., Ellsworth, W.L., Cockerham, R.S., Lester, F.W., and Corbett, E.J., 1991, The seismotectonic fabric of central California, *in* Slemmons, D.B., Engdahl, E.R., Zoback, M.D., and Blackwell, D.D., editors, Neotectonics of North America: Geological Society of America, Decade Map Volume 1, p. 107-132.

ICBO, 1994, Uniform Building Code: Whittier, California, International Conference of Building Official, 3 volumes. *(Chapters 16, 18 and A-33 apply in regards to seismic design, foundations, and grading.)*

Idriss, I.M., 1990, Response of soft soil sites during earthquakes, *in* Duncan, J.M., *editor*, Proceedings of the H. Bolton Seed Memorial Symposium: BiTech Publishers Ltd., v. 2, p. 273-289.

Jennings, C.W., 1994, Fault activity map of California and adjacent areas: California Division of Mines and Geology, Geologic Data Map 6, scale 1:750,000. *(Will be published in autumn 1994; faults are color-coded by recency of movement.)*

Joyner, W.B., and Boore, D.M., 1988, Measurement, characterization, and prediction of strong ground motion, *in* VonThun, J.L., *editor*, Earthquake engineering and soil dynamics II: American Society of Civil Engineers, Geotechnical Special Publication 20, p. 43-102. *(This reference is typically used by engineers, seismologists, and geologists for evaluation of strong motion.)*

Petersen, Mark D., and Wesnousky, S.D., 1994, Fault slip rates and earthquake histories for active faults in southern California: Seismological Society of America Bulletin, v. 84, no. 5, October 1994.

Reiter, Leon, 1990, Earthquake hazard analysis: Columbia University Press, 254 p. *(A comprehensive text which explains probabilistic seismic hazard analysis and applications of strong-motion seismology.)*

Rymer, Michael J., and Ellsworth, William L., *editors*, 1990, The Coalinga, California, Earthquake of May 2, 1983: U.S. Geological Survey Professional Paper 1487, 417 pages, 23 chapters by 62 geologists and seismologists. *(The definitive publication about the 1983 Coalinga earthquake, which is the prototype of a blind-thrust earthquake along the western margin of the San Joaquin Valley. These kinds of blind-thrust faults are of particular concern because they are believed to be the source of regional seismic shaking which would affect Madera County.)*

Stein, R.S., and Ekstrom, G., 1992, Seismicity and geometry of a 110-km-long blind thrust fault; part 2, Synthesis of the 1982-1985 California earthquake sequence: Journal of Geophysical Research, v. 97, part B, no. 4, p. 4865-4883.

Stein, Ross S., and Yeats, Robert S., 1989, Hidden earthquakes: Scientific American, v. 260, no. 6, p. 48-57. *(Explains the concepts of blind-thrust faults and Coalinga-type earthquakes which might affect western Madera County.)*

Stover, C.W., and Coffman, J.L, 1993, Seismicity of the United States, 1568-1989 (revised): U.S. Geological Survey Professional Paper 1527, 418 p. *(An up-to-date catalog listing all significant American earthquakes.)*

Toppozada, T.R., Real, C.R., and Parke, D.L., 1981, Preparation of isoseismal maps and summaries of reported effects for pre-1900 California earthquakes: California Division of Mines and Geology, Open-File Report 81-11, 182 p. *(Contains maps of the felt areas of older historic earthquakes.)*

Toppozada, T.R., and Parke, D.L., 1982, Areas damaged by California earthquakes, 1900-1949: California Division of Mines and Geology, Open-File Report 82-11, 65 p.

Wallace, Robert E., *editor*, 1990, The San Andreas fault system, California: U.S. Geological Survey Professional Paper 1515, 283 pages, 10 chapters. *(Explains the nature of the San Andreas fault in the Parkfield area which is relevant to western Madera County.)*

Wesnousky, S.G., 1986, Earthquakes, Quaternary faults, and seismic hazard in California: Journal of Geophysical Research, v. 91, no. B-12, pages 12,587-12,631. *(A comprehensive catalog and discussion of earthquakes and active faulting throughout California.)*

Seismic Safety booklets useful for property owners.

SSC, 1992, The homeowner's guide to earthquake safety: Seismic Safety Commission, State of California, 28 p. booklet. *(Available for purchase at $2.25 from SSC at 1900 K Street, Suite 100, Sacramento, CA 95814-4186 or telephone 916-323-4213.)*

SSC, 1992, The commercial property owner's guide to earthquake safety: Seismic Safety Commission, State of California, 32 p. booklet. *(Available for purchase at $3.25 from SSC at 1900 K Street, Suite 100, Sacramento, CA 95814-4186 or telephone 916-323-4213.)*

Yanev, Peter I., 1991, Peace of mind in earthquake country: San Francisco, Chronicle Books, 218 p., $14.95. *(Contains practical advice and diagrams from a structural engineer about retrofitting or bracing homes to resist seismic shaking.)*

Quaternary Geology of Madera County

Flatland alluvial deposits of the San Joaquin Valley occur in the western third of Madera County.

Bartow, J.A., 1983, Map showing configuration of the basement surface, northern San Joaquin Valley, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1430, scale 1:250,000.

Bartow, J.A., 1985, Map showing Tertiary stratigraphy and structure of the northern San Joaquin Valley, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1761, scale 1:250,000.

Bartow, J.A., 1991, The Cenozoic evolution of the San Joaquin Valley, California: U.S. Geological Survey Professional Paper 1501, 40 p.

Helley, E.J., 1978, Alluvial fan of the Chowchilla River and adjacent foothills area, Mariposa, Merced, and Madera counties, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-927, scale 1:62,500.

Marchand, D.E., and Allwardt, A., 1981, Late Cenozoic stratigraphic units of northeastern San Joaquin Valley, California: U.S. Geological Survey Bulletin 1470, 70 p., plate 1, scale 1:125,000.

Marchand, D.E., 1976, Preliminary geologic maps showing Quaternary deposits of the Madera area (Poso Farm, Firebaugh NE, Bonita Ranch, Madera, Gregg, Lanes Bridge, Friant, and Academy 7½-minute quadrangles), eastern San Joaquin Valley, Madera and Fresno counties, California: U.S. Geological Survey Open-File Report 76-841, 8 map sheets at scale 1:24,000.

Marchand, D.E., 1976, Preliminary geologic maps showing Quaternary deposits of the Chowchilla area (Santa Rita Bridge, Bliss Range, Chowchilla, Berenda, and Kismet 7½-minute quadrangles), eastern San Joaquin Valley, Madera and Merced counties, California: U.S. Geological Survey Open-File Report 76-839, 12 p. text, 5 map sheets at scale 1:24,000.

Marchand, D.E., 1976, Preliminary geologic maps showing Quaternary deposits of the Daulton area (Raymond, Daulton, Little Table Mountain, and Millerton Lake West 7½-minute quadrangles), eastern San Joaquin Valley, Madera County, California: U.S. Geological Survey, Open-File Report 76-840, 12 p., 4 map sheets at scale 1:24,000.

Marchand, D.E., 1976, Preliminary geologic maps showing Quaternary deposits of the southern Merced area (San Luis Ranch, Sandy Mush, El Nido, Plainsburg, Le Grand, and Raynor Creek 7½-minute quadrangles), eastern San Joaquin Valley, Merced and Madera counties, California: U.S. Geological Survey, Open-File Report 76-838, 12 p. text, 7 map sheets at scale 1:24,000.

Palmer, C.M., and Merrill, Robert D., 1982, Braided-stream and alluvial-fan depositional environments in the lower to middle Eocene Ione Formation, Madera County, California, *in* Ingersoll, R.V., and Woodburne, M.O., *editors*, Cenozoic non-marine deposits of California and Arizona: Society of Economic Paleontologists and Mineralogists, p. 1-10, 29 references.

USGS, 1976, Land use and land cover and associated maps for San Jose, California: U.S. Geological Survey Open-File Report 76-639, scale 1:250,000. *(Covers the western-most portion of Madera County.)*

USGS, 1978, Land use and land cover and associated maps for Mendota, California: U.S. Geological Survey Open-File Report 78-43, scale 1:250,000.

USGS, 1980, Land use and land cover and associated maps for Mariposa, California: U.S. Geological Survey Open-File Report 80-628, scale 1:250,000.

Bedrock Geology of Madera County

Metamorphic and plutonic rocks of the Sierra Nevada geomorphic province occupy the eastern two-thirds of Madera County.

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Note to the Reader:

This selected geology bibliography for Madera County was prepared August 9, 1994 by Robert H. Sydnor, senior engineering geologist with the California Division of Mines and Geology, 801 K Street, Mail Stop 12-32, Sacramento, CA 95814-3531.

This selected bibliography is intended for general reference use by those preparing environmental impact reports for new projects in Madera County. Many older and superseded geological references were omitted for brevity.

New geologic maps and reports prepared by the U.S. Geological Survey, the California Division of Mines and Geology, and academia are periodically published; readers should update this Madera County bibliography using "GeoRef" bibliographic search methods, available on compact-diskettes (CD-ROM) from the American Geological Institute. The nearest large university library available to Madera County citizens is California State University, Fresno. Most of the publications dated prior to 1970's are now out-of-print, but still contain significant geologic information. The single best publication covering all of the Sierra Nevada province of Madera County is Bateman (1992), USGS Professional Paper 1483. The best publication covering the San Joaquin Valley province is Bartow (1991), USGS Professional Paper 1501. Both are in-print as of August 1994.

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